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MANUAL OF COST ACCOUNTS

BY

H. JULIUS LUNT

FELLOW OF THE INSTITUTE OF CHARTERED ACCOUNTANTS
FELLOW OF THE INSTITUTE OF COST AND WORKS ACCOUNTANTS

AND

ARTHUR H. RIPLEY

FELLOW OF THE INSTITUTE OF COST AND WORKS ACCOUNTANTS

SEVENTH EDITION

Fourth Impression

LONDON
SIR ISAAC PITMAN & SONS, LTD.
1946

SIR ISAAC PITMAN & SONS, LTD.
PITMAN HOUSE, PARKER STREET, KINGSWAY, LONDON, W.C.2
THE PITMAN PRESS, BATH
PITMAN HOUSE, LITTLE COLLINS STREET, MELBOURNE
UNITEERS BUILDING, RIVER VALLEY ROAD, SINGAPORE
27 BECKETTS BUILDINGS, PRESIDENT STREET, JOHANNESBURG

ASSOCIATED COMPANIES
PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET, NEW YORK
205 WEST MONROE STREET, CHICAGO
SIR ISAAC PITMAN & SONS (CANADA), LTD.
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE, 381–383 CHURCH STREET, TORONTO

THE PAPER AND BINDING OF
THIS BOOK CONFORM TO THE
AUTHORIZED ECONOMY STANDARDS

MADE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH
D6—(B.1765)

PREFACE
TO SEVENTH EDITION

THE increasing use of the MANUAL OF COST ACCOUNTS as a textbook indicates the extent of the appreciation by students and others of the book in its present form.

In preparing the Seventh Edition the opportunity has been taken to substitute the term "Overhead" for the word "Oncost," which though widely used is open to considerable objection. No other changes have been made in this edition.

The principles of costing explained in Part I show the adoption of method to suit different businesses, and in Part II the detail is amplified to illustrate the use of costing for engineering purposes.

The use of costing, not only for price fixing but also for controlling expenditure, has an importance that is becoming more widely recognized. Application must be adapted to individual businesses, but the basic principles require to be followed universally.

On pages 218-235 will be found various questions for class work in addition to the exercises illustrated at the end of each chapter.

H. JULIUS LUNT.
ARTHUR H. RIPLEY.

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MANUAL OF COST ACCOUNTS

PART I

COSTING PRINCIPLES

CHAPTER I

INTRODUCTION

THE subject of Cost Accounts has come into prominence in recent times because of the increased interest in more accurate methods.

A United States Government Committee has made an official inquiry into the subject and states that "an amazing number of manufacturers, particularly the smaller ones, have no adequate system for determining their costs, and price their goods arbitrarily." Probably in this country less than 10 per cent of the manufacturing firms have an efficient system of Cost Accounts.

Many manufacturers are content to have a periodical Trading and Profit and Loss Account which merely shows the result of their operations as a whole. From these accounts, however, nothing can be learnt as to any particular work which is making big profit, or as to work which may be entailing heavy loss. Transactions of both kinds mingle together in making up the totals recorded in the financial books.

The conduct of large organizations requiring strict control of vast sums laid out in material and wages and the determination of responsibility for each detail leads to the introduction of complicated accounts. In such cases particularly, and in small businesses also, the value of knowledge concerning operations in progress cannot be overestimated, and it is to provide for this phase of accounting that Cost Accounts come into use.

In some cases the financial accounts can be arranged so as to classify the expenses in sufficient detail and provide a return of the cost of a standard unit, department or process.

A separate system of accounts is required in other cases which must analyse the financial results so as to determine the cost of material used in the manufacture of any particular unit; the wages expended on it; and the other sources of expense which are incurred to bring it to perfection and dispose of it on the market. These must be charged accurately against the selling price of each unit so that the profit and loss can be ascertained.

It is the object of *financial accounts* to obtain and maintain accurate records of the transactions and results of a business, in the most direct manner possible and with a minimum of detail.

Contrasted with this view of affairs is the standpoint of the manufacturer or salesman requiring to estimate for future work, and having to regard each separate sale as a possible profit or loss according to the price he offers. In fixing such price he must not be so high as to lose the order nor must he be so low as to lose his profit.

In merchanting, where goods are sold substantially in the same form as when purchased, little difficulty arises, because the mere addition of a percentage is sufficient to cover the known establishment expenses. Fluctuations of market must be watched, but there are few opportunities for sources of leakage, as, for example, wages paid without adequate corresponding return. This may occur easily in a manufacturing business, especially in the case of indirect or non-productive labour.

In large businesses, where vast sums are laid out in the purchase of materials, and payment of wages, it is essential that each lb. of material, or each hour of time, should be traceable so that it may ultimately be charged to a particular customer, who, at the time when the outlay is made, may quite possibly be unknown.

Further, in order to control the work that is put in

hand, and to organize it to ensure that it must prove profitable, very great detail in the records will be essential.

The aim of a manufacturer in seeking profits must always be to conduct operations on lines of the highest efficiency, thus obtaining the *maximum product* for the labour expended, which is not the same thing at all as the payment of the lowest wages. Correct costing means *high efficiency* with high wages and a minimum of *unremunerative* labour.

An economically managed factory receives the bulk of the orders by reason of the fact that it is able to tender on a competitive basis, to cut the price, at the same time ensuring a fair profit; and to execute the order with confidence and speed. An economically managed factory is not necessarily one in which low wages and salaries are paid. Experience has proved that the reverse is often the case.

It is further noticeable that a sound costing system plays an important part in works organization and expense control. When the factors which are causing expense can be localized and scrutinized, it becomes possible to obtain considerable economies which are not brought to light in a works where there is no system to make someone responsible at each stage.

The outlay of capital, whether permanent as in buildings and plant or circulating as in materials and wages, can be controlled in detail by means of Cost Accounts; here are recorded all details of raw material, its use, its value from time to time; what labour is spent on it, and the expense incurred until the commodity emerges as a finished and saleable product.

Method of Presentation.

The method of presentation of cost results is also important. It is obvious that little or nothing can be learned from a ledger record of the results, representing profits or losses on innumerable jobs. There must be a

periodical tabulation of results; comparisons of the cost of like jobs with one another; comparisons of all jobs with estimates and regular management reports based on the information thus obtained

Relationship with Financial Accounts.

It is essential that close relationship should exist between the costing and the financial accounts A sound system and regular comparisons will ensure agreement between the results shown in the two sets of accounts; and the value of the cost results is enormously increased when this agreement can be demonstrated: so that continuous cost records and not merely occasional tests should be maintained. Where for detailed results reliance has to be placed upon occasional tests, the accounts should be so arranged as to provide a means of comparison and check upon such data.

The control of the cost system by means of a Cost Ledger (or Work-in-Progress) Account in the financial books can be strongly recommended on these grounds.

Costs and Estimates.

Cost Accounts also differ from estimates; they are historical records and are useful in preparing estimates of future costs, which, however, are of the nature of forecasts, being based on expectations of market changes, wages fluctuations, and expense variation.

The chief points of difference are—

Estimates are based upon—

1. Market quotations;
2. Expectations as to price fluctuations;
3. Labour rates; and
4. Expense rates current at time of quoting.
5. Estimates may be given regardless of profit to secure business.

Costs only take note of actual price paid for material used and wages paid; actual expenses current at time of execution.

The true place for cost records in regard to estimating is that they form a reliable history of past work from which future plans may be formed by taking into account alterations in any or all of the factors.

Estimates cannot be prepared from the general financial returns in a business handling a variety of products, with the same exactness that is obtainable when Cost Accounts are kept, and thus over- or under-estimating is inevitable.

It is only necessary to mention that under-estimating leads to unprofitable work, and over-estimating means loss of profitable orders, to see the double evil that may ensue.

Costing Methods.

The unit of work or production may be a ton of coal at a colliery, a sack of flour at a flour mill, or a ton of steel at a steel works. In such cases a method of *Single Cost* may be used.

To meet the case of Railways, Tramways, Carriers and similar businesses rendering services rather than producing goods, the method of *Operating Cost* applies. This method is on similar lines to Single Cost, but with a unit of a train-mile, wagon-mile, car-mile or ton-mile, as the case may be with a system of expense classification following the organization of the operating and maintenance departments.

By another method a factory may be divided into departments, in each of which there is a separate unit of production. In such cases, in order to frame a Cost Account system, the first step is to provide separate *Departmental* Trading and Profit and Loss Accounts.

The unit may be a ton of oil at an oil mill, a piece of cloth at a print works, or a ton of hydrochloric acid at a chemical works. In these cases a method of *Process Costs* is used, by which the cost of each process through which the material passes will be shown.

The unit in the case of a builder and contractor is the contract undertaken. Each separate contract must have an individual account showing its profit or loss. This is

the method of preparing Cost Accounts for each job, and is known as *Terminal Costs*, because each unit of work proceeds independently of the others, whether it be a house or works in the case of a builder or a railway bridge or steamship in the case of a contractor.

The most complicated costing work is found in an extensive works making numerous types of machines. The processes are carried on regardless of the particular article for which the work is ultimately intended; and material passing through the same processes will ultimately be found made up into machines of different capacity, design, purpose, and value.

This method is termed *Multiple Cost*, and it is a development of the principle of charging costs to each job, and is applicable to a great variety of trades.

In large works many costing systems are in use in different departments; the means being adapted to suit the work. At some stages short cuts will be possible and it is part of the Cost Accountant's methods to introduce systems which will eliminate some of the detail of individual Job Costing and give correct records.

Objects in Keeping Cost Accounts.

(1) To be able to ascertain the cost of any one product, department, or process independently of other work going on in the factory at the same time. (2) Reduction of waste in material, time, and sundry stores. (3) Reduction of general expense rates due to better organization and improved output. (4) Records of past work to form a valuable base for future efforts.

What Cost Accounts Show.

Cost Accounts are accordingly adopted in manufacturing businesses, and give an analytical view of the same records as are condensed in the financial accounts, so as to show the cost of production per unit of work turned out. They serve as—

1. A record of results for statistical purposes, forecasts ; and for obtaining interim Profit and Loss Statements and approximate Balance Sheets.

2. A guide for future estimates, quotations, and for price-fixing, especially when output may be dependent upon price limitations.

3. A means to reducing cost of production by economies in design, methods and equipment ; or by obtaining increased output.

4. A means of control for detecting losses, waste, unremunerative expense and for improving organization.

It is essential that such accounts be *accurate*, otherwise the value of the results is clouded by uncertainty. They must necessarily be detailed, and the usual difficulty is to obtain sufficient detail without incurring great expense in salaries. On this account every opportunity must be sought to adopt abbreviated methods and to eliminate duplication. At the same time it must be borne in mind that in practical application the cost of running a sound costing system is repaid many times over by the economies which it will effect.

Great difficulty arises in fairly allocating indirect expenses and the circumstances governing every particular case must be carefully studied.

Accountants must be able to recommend the principles upon which the costing system for a particular business can most suitably be framed, and to draw up, in connection with the technical managers, the detailed accounts, schedules, preliminary records, and other details which may be required ; also to recommend improvements in methods of routine, particularly with the aim of securing greater accuracy and promptitude in the returns obtained from the costing system, and to advise upon various systems.

Bonus schemes are likely to play an important part in future arrangements of industry. The success of such schemes is closely bound up with the working of the

costing system, for it is only by intelligent appreciation of economies in working, that a degree of efficiency can be maintained under keen competition which will ensure regular and substantial profits in any trade ; and the production statistics obtainable in the Cost Accounts will be of vital assistance in such matters.

It is impossible to make the working of any business fit into a ready-made costing system. The system must be adapted to suit the business. In every case forms suitably ruled, and specially drafted schedules for accounts and record books will be required. These must be intelligently prepared to suit the circumstances in each case.

Financial Accounts.

The Trading and Profit and Loss Accounts may be made to yield much useful information. They should be drafted so as to separate manufacturing expenses from administration and selling expenses, and so that the factory cost of the output can be obtained.

The arrangement of the Trading and Profit and Loss Accounts should be as follows—

(1) Raw Material Accounts to which purchases are charged ; the materials used will be credited and transferred to the Manufacturing Account. The total amount used in any period is obtained by totalling requisitions for supplies of materials to the workshops, or by taking stock of material still in store and transferring the balance of the account as material used. (See Wheat Account, page 17.)

(2) Manufacturing Account, to which material used, direct wages and works expenses are charged ; finished goods are transferred to Finished Goods Account, and work-in-progress remains as a balance. (See page 17.)

(3) Trading and Profit and Loss Account to which is charged the cost of manufactured goods sold. This is obtained from the Finished Goods Account after crediting stock on hand. Expenses of selling and distribution and general administration are charged here. (See page 17.)

Raw materials which directly enter into production and similarly direct wages engaged upon productive work must be accounted for separately from indirect material, e.g. oil for lubricating machinery; and indirect wages, e.g. foremen or timekeepers. Further, the Expense Accounts must show clearly the cost of each source of expenditure, e.g. such an account as wages should be subdivided and separate accounts kept for direct wages and indirect wages. These may be further dissected so that the indirect wages will be grouped as foremen, timekeepers, stores clerks, etc., each group having its own expense account; and in the arrangement of other expense accounts a similar careful dissection will be required.

EXAMPLE I

The estimate for certain work is computed to be—

	£
Material.	500
Wages	300
Works Expense	200
General Expense	150
Profit	150

What profit will there be if materials fall 5 per cent, wages due to overtime increase by 15 per cent, and works expense 5 per cent, general expense as stated, but discount 1¼ per cent allowed?

ANSWER

Cost Sheet

	£	s.	d.
Materials, £500 less 5% = ...	475	–	–
Wages, £300 + 15% = ...	345	–	–
Works Expense, £200 + 5% = . . .	210	–	–
General Expense	150	–	–
Discount, 1¼% on £1,300	16	5	–
	£1,196	5	–
Profit	103	15	–
	£1,300	–	–

EXAMPLE II

The turnover of a business falls and from being £50,000 in a normal year is expected to amount to only £35,000 in the next. Assuming the fixed charges to be £3,750 and the rate of net profit 5 per cent on the turnover in a normal year, what result is likely to be produced by the fall in output?

ANSWER

	£	£	
Normal Year—			
Turnover	50,000		
Fixed Charges		3,750	= 7½%
Net Profit		2,500	= 5%
			12½%
Following Year, Turnover	35,000		

	£
Margin for Fixed Charges and Net Profit—12½%	4,375
Fixed Charges	3,750
Anticipated Profit	£625

EXAMPLE III

Owing to faulty records, the cost of an article is estimated as follows—

	£	s.	d.
Materials	5	10	–
Labour—115 hours at 2s.	11	10	–
Works Expense—50% on Labour	5	15	–
	22	15	–
General Expense, 10%	2	5	6
	25	–	6
Profit	4	19	6
Price quoted	£30	–	–

The following adjustments are necessary—

(1) Waste of material not allowed for, 10 per cent.
(2) Labour—151 hours, not 115 hours.
(3) Works expense of department where work is done, 60 per cent, not 50 per cent.
(4) General expense rate adjusted to 12½ per cent on account of extra advertising.

What will be the result of the order if obtained?

ANSWER

Revised Estimate

	£	s.	d.
Materials £5 10s. + 10%	6	1	–
Labour—151 hours at 2s.	15	2	–
Works Expense 60%	9	1	3
	30	4	3
General Expense, 12½%	3	15	6
	33	19	9
Profit estimated	4	19	6
Revised Price should be	£38	19	3

At the price of £30 there will be a loss of £3 19s. 9d.

CHAPTER II

DEFINITIONS

SINGLE (OUTPUT) COST is applicable to businesses supplying a uniform product where the object is to ascertain the cost per unit obtained.

DEPARTMENTAL COST is the method employed to ascertain the profits of departments of a business.

PROCESS COSTING is used to ascertain the cost of each stage of manufacture where material is passed through various operations to obtain a final product or result; with by-products in many cases at different stages.

JOB COSTS are employed to charge the cost of production against the different jobs that are undertaken.

TERMINAL COSTS are employed to show the cost of carrying out contracts and undertakings which are by their nature entirely separate and are terminated by the completion of the work.

MULTIPLE COSTS apply to businesses where the products differ widely in type, value and complexity; where similar operations may be used to give widely differing ultimate results; where specialization and the standardization of parts may be extensively adopted.

OPERATING (WORKING) COSTS apply to businesses carrying on services rather than producing goods.

PRIME COST (or FLAT COST) is the cost of material used and labour expended directly in producing an article; completing a piece of work or carrying on a service.

DIRECT MATERIAL is the material used in the manufacture of an article, or in the construction of an undertaking which can be charged specifically to the job, including:

(*a*) Direct purchases which can be allocated to the job from the invoice.

(*b*) Stores material which is withdrawn from general stores to be charged to specific work.

INDIRECT MATERIAL comprises all materials which are not capable of being allocated to specific work.

DIRECT LABOUR (also termed Productive labour) is labour which is expended specifically upon the construction of an article, and may be skilled or unskilled. It is differentiated from

INDIRECT (or Non-productive) labour engaged upon general services connected with the running of a factory as a whole.

CHARGEABLE EXPENSES are those which can be allocated directly to specific jobs.

ESTABLISHMENT CHARGES, signifying Indirect Expense, may be divided into Works Expense, Office and Administration Expense, and Selling and Distribution Expense.

WORKS EXPENSE is that expense which is properly concerned with the running of a factory or plant, and is embraced in the cost of production ; it will include Expense of Works Management and Administration.

COST OF PRODUCTION is the *Prime Cost* plus the proportion of Works Expense properly chargeable against the production of an article.

WORKS COST, FACTORY COST and MANUFACTURING COST signify Cost of Production.

OVERHEAD, also known as ONCOST, EXPENSE, BURDEN, or ESTABLISHMENT CHARGES, is divided into *Works Overhead*—signifying the charge which is made in Cost Accounts to cover Works Expenses; and *Office Overhead*, signifying the charge which is added to Cost of Production to cover General Expenses.

GROSS COST is the Cost of Production, plus the proportion of General Expenses, including Management, Selling, Distribution and Office Expense.

DIRECT LABOUR (PRODUCTIVE) HOUR method is the system of charging expenses to jobs on the basis of the hours of Direct (Productive) Labour spent on them.

WORK-IN-PROGRESS is the uncompleted work on hand at any time, being uncompleted contracts in the case of a contractor or partly finished goods in the case of a manufacturer.

DEPRECIATION is the inherent wastage in value of an asset due to any cause.

STANDING EXPENSE includes Indirect Expense of a fixed and permanent character, e.g. Rates.

INCIDENTAL or FLUCTUATING EXPENSE includes Indirect Expense of a variable character, e.g. Repairs.

PRODUCTION UNIT signifies a common standard in terms of which the output of a works or department may be measured.

PRODUCTION HOUR signifies time expended by employees in Direct (Productive) Labour.

EXAMPLE IV

The yearly expenditure of a business was as follows—

	£
Direct Material	20,500
Direct Wages	12,500
	33,000
Departmental Overhead	10,000
Selling, Delivery, and General Administration Expenses	1,000
	£44,000

The capital of the business was £11,000. The cost of an article is calculated as follows—

	£	s.	d.
Material Cost	2	–	–
Wages Cost	4	–	–
	6	–	–
Overhead (33% of Direct Material and Labour)	2	–	–
	£8	–	–

Does this express the true cost of production and sale? If not, work out a more accurate cost, making provision at the same time for a profit which would yield 10 per cent on the capital employed.

ANSWER

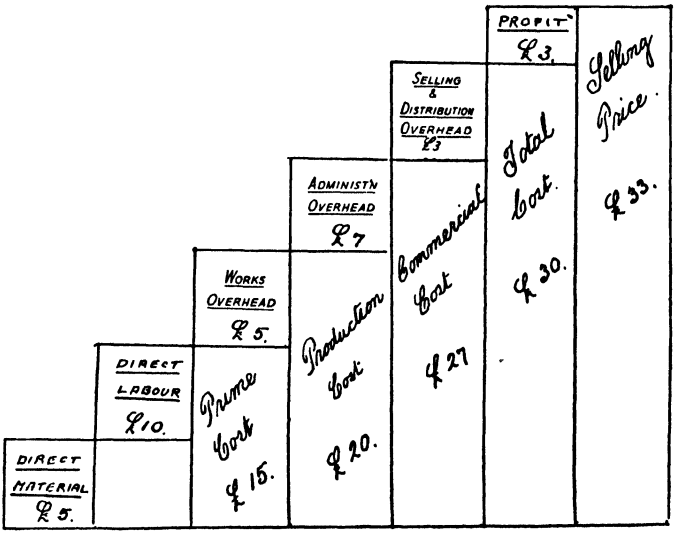
	£	s.	d.
Material Cost	2	–	–
Wages Cost	4	–	–
Departmental Overhead—			
80% on Wages	3	4	–
	9	4	–
Selling, etc., Overhead—			
2·33% on Works Cost		4	3
	9	8	3
Profit—2·5% on Gross Cost		4	9
	£9	13	–

10% on £11,000 = £1,100

£1,100 = 2·5% of £44,000

DIAGRAM SHOWING ELEMENTS OF COST

THE FIGURES GIVEN HAVE NO SIGNIFICANCE OTHER THAN TO SHOW HOW A TYPICAL COST IS BUILT UP



CHAPTER III

SINGLE (OUTPUT) COSTS

Single Cost.

Single Cost is applicable to businesses supplying a uniform product where the object is to ascertain the cost per unit produced, e.g. per lb. of yarn in spinning mills, per yard of cloth in textile factories, per sack of flour in a flour mill, per ton of coal in a colliery, per ton of steel at a steel works.

Abstracts from the financial accounts will provide the cost sheets required without the necessity for separate cost books.

Manufacturing businesses use Single Costs when turning out a standard product, but in most instances a division into departments, each handling a separate range of goods, will be desirable ; or a division of the cost of manufacturing a single product into processes or stages of manufacture will be useful. In these cases the methods described under Department Cost and Process Cost will be applicable.

Where a common basic unit for the whole production can be arrived at, the charges in the Manufacturing Account can be compared between different periods by reducing each item to the cost per unit for the period.

In the Trading Account the percentage of each item to the Sales should be stated.

The most convenient period for making up a periodical cost sheet must be considered. In some businesses a weekly reckoning is made ; in others a monthly account is considered adequate ; while in other cases a four-weekly period with 13 periods to the year is found most satisfactory, in consequence of the comparison of results not being disturbed by irregularity in the length of the periods.

Assuming that a monthly period is to be used, a Monthly Manufacturing and Trading Account will be required and records of output for the period.

FIRST ACCOUNT—

RAW MATERIAL

WHEAT ACCOUNT No. 1. MANITOBA

19..		£	19..		£
Jan. 1.	To Stock	2,000	Jan. 31.	By Transfer to Manufacturing A/c (at average cost price)	3,500
„ 31.	„ Purchases	3,000	„ „ „	Stook on hand	1,500
		£5,000			£5,000

SECOND ACCOUNT—

MANUFACTURING ACCOUNT

Month of January

Output 43,260 Sacks

19..		Tons.	£	Net Cost per Sack s. d.	19..		Tons.	£
Jan. 31.	To Wheat: No. 1.	220	3,500		Jan. 31.	By Trading A/c Flour = 43,260 sacks of 240 lbs.	4,635	87,000
„ „	„ „ 2.	620	10,000					
„ „	„ „ 3.	4,900	81,500					
		5,740	95,000	38 5	„ „	„ Offals	1,100	11,875
„ „	„ Direct Wages		2,750	1 3	„ „	„ Loss in Milling = 1%	5	
„ „	„ Factory Exps. £ Wages 270 Coal 200 Electricity 150 Repairs 220 Sacks & Sundry Chgs. 115 Deprecn. of Plant 170		1,125	6				
		5,740	£98,875	40 2			5,740	£98,875

THIRD ACCOUNT—

TRADING AND PROFIT AND LOSS ACCOUNT

Month of January

19..		Tons.	£	19..		Tons.	£
Jan. 1.	To Stock of Flour	3,090	51,875	Jan. 31.	By Sales	6,475	115,000
31.	Manufacturing A/c.	4,635	87,000				
		7,725	138,875				
	Less Stock Jan. 31	1,250	25,000				
		6,475	113,875				
„ „	„ Gross Profit		1,125				
		6,475	£115,000			6,475	£115,000

PROFIT AND LOSS ACCOUNT

19..		% on Sales.	£	19..	£
Jan. 31.	To General Exps. viz.—			Jan. 31. By Gross Profit (=·98% on Sales	1,125
	Office Salaries	·07	85		
	Sundry Exps.	·03	30		
	Travellers	·1	120		
	Advertising	·04	50		
	Carriage	·3	340		
	Discount	·07	75		
	Interest	·05	60		
		·66%	760		
„	„ „ Net Profit.	·32	365		
		·98%	£1,125		£1,125

Returns of materials used in quantities and value and detailed record of production form an essential part of this system. Material must be priced at actual cost, and wages must be grouped under productive operations to enable comparisons to be usefully made.

In addition to values, *returns of quantity* in respect of all products should be made so that the volume of waste and cost *per unit* can be worked out; this cost will be found important in all comparisons.

The gross profit must be arrived at—

(*a*) By ascertaining actual value of stocks; or

(*b*) By charging to Manufacturing Account material put in hand and crediting finished stock and estimating work in progress; or

(*c*) By assuming a percentage based on experience.

There will usually be a steady relation between quantity of material used and quantity of output and work in progress, but fluctuations in price must not be disregarded.

A Monthly Expense Summary should be prepared from the Nominal Ledger, and after suitable adjustment as regards outstanding or prepaid items the expenses for the month are obtained.

In the calculation of expenses the monthly quota must not represent merely purchases of stores, e.g. coal, repair material, oil, etc., but stocks on hand must be taken into account and net amounts consumed only must be charged up.

FOURTH ACCOUNT—

MONTHLY COMPARISON

Output	Month end ng 31st January. 43,260 sacks		Corresponding Month last year. 55,000 sacks		Total for 4 Months since Stocktaking. 190,000 sacks		Corresponding Period last year. 245,000 sacks	
		Cost per Sack.		Cost per Sack.		Cost per Sack.		Cost per Sack.
Manufacturing Account—	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Cost of Wheat (*less* Offals)	83,125	38 5	116,000	42 2·4	402,000	42 3·8	522,000	42 7·3
Wages	2,750	1 3	2,500	10·9	10,200	1 0·9	10,000	9·8
Factory Expenses:								
Wages	270	1·4	240	1·1	780	1·	720	·7
Coal	200	1·1	180	·8	570	·8	550	·5
Electricity	150	·8	120	·5	540	·6	250	·3
Repairs	220	1·2	250	1·1	450	·5	370	·4
Sundry	115	·6	120	·5	120	·1	130	·1
Depreciation	170	·9	180	·8	680	·9	700	·7
	£87,000	40 2	£119,590	43 6·1	£415,340	43 8·6	£534,720	43 7·8
Trading Account—		Percentage on Sales.		Percentage on Sales.		Percentage on Sales.		Percentage on Sales.
Sales	£115,000		£120,000		£400,000		£550,000	
Gross Profit	1,125	·98%	2,910	2·43%	4,660	1·16%	12,280	2·23%
Expenses								
Office Salaries	85	·08	80	·07	340	·08	320	06
Sundry Expenses	30	·03	50	·04	150	·04	130	·02
Travellers	120	·1	130	·11	420	·11	500	·09
Advertising	50	·04	70	·06	130	·03	70	·01
Carriage	340	·3	370	·31	1,200	·3	1,300	·24
Discounts	75	·06	90	·07	260	·06	300	·05
Interest	60	·05	55	·05	240	·06	250	·04
Net Profit	365	·32	2,065	1·72	1,920	·48	9,410	1 72
	£1,125	·98%	£2,910	2·43%	£4,660	1·16%	£12,280	2·23%

COLLIERY COST SHEET. PIT No. 2

WEEK ENDING 10TH JANUARY, 19..

Coal Worked, 2,000 tons. Last week, 2,400 tons.

	£	£	£ s. d.	Per ton.	£	£	£ s. d.	Per ton.
UNDERGROUND—								
Wages		1,000		10 –		1,320		11 –
Pitwood		150		1 6		180		1 6
Stores		200		2 –		240		2 –
Horsekeep		80		9·6		120		1 –
	1,430	1,430	14 3·6	14 3·6	1,860	1,860	15 6	15 6
SURFACE COSTS—								
Wages		500		5 –		660		5 6
Stores		150		1 6		140		1 2
Horsekeep		40		4 8		40		4
	690	2,120	6 10·8	1 1 2·4	840	2,700	7 0	1 2 6
DISTRIBUTION COSTS—								
Truck Hire		80		9 6		90		9
Railway Charges		350		3 6		420		3 6
	430	2,550	4 3·6	1 5 6	510	3,210	4 3	1 6 9
ESTABLISHMENT AND OTHER CHARGES—								
Royalties		40		4 8		40		4
Rates		10		1·2		10		1
General Expenses		15		1·8		12		1·2
Bank Charges		4		·48		4		·4
Commission		40		4 8		43		4·3
Discount		10		1 2		12		1·2
Insurance		15		1 8		15		1·5
Capital Sinking Fund		40		4 8		48		4·8
	174		1 8·88		184		1 6·4	
	£2,724	£2,724	£1 7 2·88	£1 7 2·88	£3,394	£3,394	£1 8 3·4	£1 8 3·4

[Each of the above main headings of expenses will comprise numerous subdivisions showing more detailed dissections.]

At the conclusion of the financial year the totals of the accounts on these lines will necessarily agree with the financial results.

The Trading Results, whether annual or monthly, should be tabulated in parallel columns over a series of periods so that costs can be compared and unremunerative expenses promptly checked. Periodically the Balance Sheet items may be similarly tabulated. The value of such comparative record cannot be over-estimated.

Specimen Cost Sheets.

The Colliery and Steel Works Cost Sheets here shown are prepared similarly from the financial books and production returns. For the setting out of comparisons recourse should be had to the use of graphs showing the results in diagrammatical form.

SUN STEEL WORKS

WEEKLY COST SHEET

For week ending 22nd November, 19..

Week's Production—
1,800 tons.

Per ton Steel Produced.		Total	Per ton Produced.
		£	£ s. d.
Cwts. 15 5	Pig Iron . . . . 1,395 tons	11,160	6 4 –
,, 4 3	Scrap . . . . 387 ,,	3,483	1 18 6
,, 2 0	Iron Ore . . . . 180 ,,	630	7 –
,, 2 0	Limestone . . . 180 ,,	180	2 –
,, 8 0	Coal . . . . . 729 ,,	864	9 6
		16,317	9 1 –
	Less Sales of Scrap, Mill Cinders and Scale	830	9 –
		15,487	8 12 –
	WAGES—		
	Smelting Furnaces and Gas Producers	2,250	1 5 –
	Ladles and Casting Pits . . .	1,350	15 –
	Rolling Mills	1,350	15 –
	Cranemen and Labourers . . .	1,080	12 –
	Boilermen and Engineers . . .	900	10 –
	Locomotive Drivers and Yardmen .	90	1 –
	PRIME COST	22,507	12 10 –

SUN STEEL WORKS—(*contd.*)

Week's Production—
1,800 tons.

Per ton Steel Produced.		Total	Per ton Produced.
		£	£ s. d.
	PRIME COST	22,507	12 10 –
	WORKS EXPENSES—		
	Sundry Stores: including oil, waste, millgrease, saw blades	180	2 –
	Rents and Rates of Works	225	2 6
	Coal for Re-heating	270	3 –
	Coal for Steam	675	7 6
	Gas, Water, Electricity	720	8 –
	Timekeepers and Store Clerks	45	6
	Repairs and Renewals	270	3 –
	Depreciation	450	5 –
	Royalties	90	1 –
	WORKS COST	25,432	14 2 6
	INDIRECT EXPENSES—		
	Management, Salesmen, and Office Salaries and General Expenses, including Interest, per Schedule	2,380	1 6 6
	Net Cost at Works	£27,812	£15 9 –

EXAMPLE V

Costa Manufacturing Company, who have standardized their successful wireless receiver, find at the end of the first year's work that they have had the following transactions.

Draw up their accounts and show the cost per article.

Materials used	£9,800
Wages	4,900
Works Expenses	2,800
Office Expenses	1,360
Sets made	700
Sets unsold	20
Sales	£20,400

Dr. MANUFACTURING ACCOUNT *Cr.*

			Cost per set.			
		£	£			£
	To Materials Used	9,800	14		By Finished Goods—	
	,, Wages	4,900	7		700 Sets	17,500
	,, Works Expenses	2,800	4			
		£17,500	£25			£17,500

Dr. TRADING AND PROFIT AND LOSS ACCOUNT *Cr.*

		Cost per set.			
	£	£			£
To Cost of 700 Sets per Manufacturing Account	17,500	£25	By Sales (680 Sets)		20,400
,, Office Expenses	1,360		,, Stock (20 Sets) (at £25)		500
Cost per Set Sold (680 Sets)		2			
		27			
,, Profit	2,040	3			
	£20,900	£30			£20,900

EXAMPLE VI

The following represents the Trading Account of a manufacturer of a patent refrigerator—

TRADING ACCOUNT

Dr. FOR YEAR ENDED 31ST DECEMBER *Cr.*

	£	s	d.		£	s.	d.
To Materials used	1,905	–	–	By Sales	7,500	–	–
,, Productive Wages	2,895	–	–	,, Stock of Finished Articles	88	15	–
,, Factory Exps.	1,221	10	–	,, Work in Progress			
,, Gross Profit c/d.	2,127	5	–	£			
				Materials 380			
				Wages. 150			
				Factory Exps. 30			
					560	–	–
	£8,148	15	–		£8,148	15	–
To Administration Expenses	1,323	–	–	By Gross Profit b/d	2,127	5	–
,, Net Profit	804	5	–				
	£2,127	5	–		£2,127	5	–

3,050 refrigerators were manufactured during the year and 3,000 were sold during the same period.

The Cost Department charged overhead on account of factory expense at 7s. 6d. per article produced and administration expense at 8s. 9d per article sold, the Cost Accounts showing an estimated total profit of £862 10s. for the year.

Prepare—

(*a*) Factory Overhead Account.
(*b*) Administrative Overhead Account.
(*c*) Reconciliation of the net profit per the cost accounts and the net profit in the financial books.

ANSWER

Dr. FACTORY OVERHEAD ACCOUNT *Cr.*

	£	s	d		£	s	d
To Expenses per Nominal A/cs	1,221	10	–	By Factory Overhead on Refrigerators Sold (3,000)	1,125	–	–
				,, do Unsold (50) . .	18	15	–
				,, do. in Progress . .	30	–	–
				,, Amount under-estimated .	47	15	–
	£1,221	10	–		£1,221	10	–

Dr. ADMINISTRATIVE OVERHEAD ACCOUNT *Cr*

	£	s	d		£	s	d
To Expenses per Nominal A/cs	1,323	–	–	By Administrative Overhead on Refrigerators Sold (3,000) .	1,312	10	–
				,, Amount under-estimated .	10	10	–
	£1,323	–	–		£1,323	–	–

Dr. PROFIT AND LOSS RECONCILIATION ACCOUNT *Cr.*

	£	s	d.		£	s	d.
To Factory Overhead under-estimated . .	47	15	–	By Profit per Costs . .	862	10	–
,, Administrative Overhead under-estimated .	10	10	–				
,, Profit for Year .	804	5	–				
	£862	10	–		£862	10	–

CHAPTER IV

DEPARTMENTAL COSTS

In a business where a single product is turned out, the method of Single Cost can be adopted, but offshoots spring up in course of time, and a successful concern turns out several types of work, or will undertake branches of trade outside its original scope of transactions, e.g. an engineering business may lay out a foundry or take up electrical work ; and in general industrial businesses these conditions invariably apply.

In these circumstances there is no single unit of production, and where a business is making two or more clearly defined varieties of goods, it is best to commence the organization of a costing system by splitting up into various departments, for each of which separate records can be obtained. It is almost invariably found when this is done that one department carries part of the expenses of, and, maybe, losses incurred by another.

Departmental Cost is the method employed to ascertain the profits of departments of a business.

The classification of departments is a matter for decision on practical grounds ; in some cases the material used may determine the division ; in other cases the nature of the machines in use, or the character of the labour employed.

It is essential, first, to prepare a detailed schedule of the work done in each of the departments, including also particulars of the stocks held on behalf of each, so that the records do not become confused at different stages.

The financial books can be adapted to furnish the information required and thus incorporate the departmental accounts.

Purchases must be analysed in the Purchases Invoice Book or a separate Purchases Book used for each department.

PURCHASES INVOICE BOOK

Date.	No.	Name.	Fo.	Total.	Raw Materials.			Sundries.			Expenses
					Silks.	Cottons.	Woollens.	Silks.	Cottons.	Woollens.	
				£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.

Sales must be similarly analysed in the Sales Book.

SALES BOOK

Date.	Name.	Fo.	Total.	Silks	Cottons.	Woollens.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.

Wages must be made out separately for each department, and in the event of some workers having booked time in more than one department, the correct amount must be recorded in each and the total arrived at in a final summary.

SUMMARY OF WAGES BOOK

	Gross Wages.			Deductions.			Net.		
	£	s	d	£	s	d.	£	s	d.
Silks Department Total . .	125	17	6	3	6	6	122	11	–
Cottons „ „ . .	154	3	7	5	13	–	148	10	7
Woollens „ „ . .	137	2	2	4	9	4	132	12	10
	417	3	3	13	8	10	403	14	5
Staff—									
Foremen, Storekeepers, and Timekeepers	15	10	6		6	6	15	4	–
Engineers	12	14	–		5	–	12	9	–
Office	22	9	6		7	6	22	2	–
	£467	17	3	£14	7	10	£453	9	5

Materials transferred from one department to another must be supplied only against written requests. These will be summarized, and a Departmental Transfer Summary prepared to show the departments supplying and receiving respectively.

DEPARTMENTAL TRANSFER BOOK

SUPPLIES TO SILKS DEPARTMENT

Week ending.	DETAILS.	Total.			From Cottons Department.			From Woollens Department.		
		£	s.	d.	£	s.	d.	£	s.	d.
Jan. 24	Requisition 524 . .	10	2	6	10	2	6			
„	„ 527 . .	15	4	3				15	4	3
„	„ 536 . .	7	15	9	7	15	9			

The Summary Totals can then be journalized to debit and credit of departments affected. Such materials, whether partly manufactured or not, must be priced at cost (plus value of work done) without any addition of profit.

A difficulty arises in determining the values in respect of the correct addition for works expense : this addition cannot be obtained by reference to the total amount of the transfers made, but must be based upon some factor more nearly related to the amount of work done to the material, and hence the cost of wages expended upon it is generally the fairest basis. The departmental factory expenses will bear an ascertainable ratio in each department to the direct wages, and this ratio should be added in making up the cost of the goods transferred to other departments.

General Expenses and Selling Cost are not chargeable except as an addition to Finished Goods when sold and dispatched.

Stocks and Stores Records.

Stocks must be classified departmentally and individual stock records in a Stores Ledger shown on the following page will be found useful.

Supplies of material from stores to departments must be recorded by means of Issues Notes and totalled in a Raw Material Summary which will give the total raw material week by week to charge to each department.

Factory Expenses.

Expenses and indirect wages chargeable to one department or another must be allocated accordingly. The distribution of general or indirect expenses including general wages charges, presents some difficulty. The division is sometimes made on the basis of direct wages paid in each department ; but it is essential for accuracy that the general factory charges should be apportioned

after ascertaining the actual facts by careful analysis on the following lines, and this subject will be found referred to in greater detail in a later chapter.

STORES LEDGER.

INWARDS.

Dr. Article————

Date.	Invoice	Supplier.	Quality	Quantity.	Price	£	s	d

OUTWARDS.

Cr

Date	S. Dept	C Dept	W Dept	Week's Consumption.	Price.	Value	Balance on Hand.	
							Quantity	Value
						£ s d		£ s. d.

A Departmental Overhead Rate should thus be arrived at and may be based upon—

(*a*) Direct Wages;

(*b*) No. of employees' working hours;

or (*c*) No. of units produced.

This will furnish a useful basis of comparison from time to time and serve as a guide in checking allowance for works expense in estimating the cost of individual orders.

The final presentation of results may be in the form of a Manufacturing Account or a Cost Summary; and the Cost Records can be usefully prepared in a Cost or

Departmental Ledger which will accumulate the results until the stocktaking figures make a reconciliation with the financial books at the close of the period.

APPORTIONMENT OF EXPENSES. [1]

	Use.	Basis of Division.
Coal	Power	Power required to drive machinery in different sections.
Rent, Rates, and Cost of Heating		Areas occupied by section.
Electricity or Gas	Power	As for Coal
" "	Lighting	Number of lights in each section.
Repairs		According to actual expenditure.
General Factory Wages and General Services		Unless circumstances require otherwise, according to totals of direct wages in each section
Sundry Stores		According to actual use.
Depreciation		According to inventory value of machinery and plant.

EXAMPLE OF EXPENSE APPORTIONMENT

Item.	Total for week. Adjusted as to outstanding or prepaid amounts.	Silks.	Cottons.	Woollens.	General Services
	£	£	£	£	£
Rent and Rates	30	15	5	5	5
Electric Power	120	50	20	40	10
Coal—heating	25	10	5	5	5
Tools	15	10	–	5	–
Repairs	50	30	5	5	10
Wages—					
Engineers' Staff	40	11	8	16	5
Storekeepers	30	10	10	10	–
Sundry Stores	20	10	5	5	–
Insurance	10	5	2	3	–
Superintendence	35	15	5	15	–
	£375	166	65	109	35
General Services		10	9	16	
		176	74	125	

Value of work in progress and finished goods unsold must be obtained week by week as closely as possible.

In many businesses where the amount of Work-in-Progress and Finished Stock is small or stationary, the credit to Manufacturing Account may be taken as actual sales, but where the stock of finished goods fluctuates, the credit of Manufacturing Account should be made up from a weekly Production Record instead of from the Day Book totals.

[1] See also pages 116–121.

NORTHERN MANUFACTURING COMPANY

Dr. DEPARTMENTAL ACCOUNT FOR WEEK ENDING 22ND NOVEMBER, 19.. *Cr.*

			Silk.				Cotton				Woollens.						Silk			Cotton			Woollens.		
		%	£	s.	d.	%	£	s	d	%	£	s	d				£	s	d	£	s	d	£	s.	d
Nov. 22	To Materials used		250	–	–		1,400	–	–		550	–	–	Nov 22	By Finished Goods Account—										
	„ Departmental Transfers—																								
	Add . . .		50	–	–		–	–	–		100	–	–		Works Cost of Goods produced . .		610	–	–	1,453	–	–	672	–	–
	Less . .						150	–	–																
		60	300	–	–	90·5	1,250	–	–	79·	650	–	–												
	„ Wages . . .	5·	25	–	–	3 8	54	–	–	5·	37	–	–												
	„ Expenses . .	35	176	–	–	5 7	74	–	–	16	125	–	–												
			501	–	–		1,378	–	–		812	–	–												
	„ Work in Progress—																								
	Less: Increase										140	–	–												
	Add: Decrease		109	–	–		75	–	–																
	„ Manufacturing Cost for Week	100	610	–	–	100	1,453	–	–	100	672	–	–				610	–	–	1,453	–	–	672	–	–

Material used will be obtained from accounts of Stocks and purchases of Materials as shown on page 17. Wages will be charged in this Account from the General Wages Account.

Expenses for the week will be obtained from the Expense Apportionment Summary and the weekly apportionment will be adjusted as required.

The percentages shown are the percentages of Manufacturing Cost of Material, Wages, and Expenses, adjusted in respect of the Material Wages and Expenses included in Work in Progress.

Detailed Cost Sheet per standard article may now be prepared in each Department based on the output in quantity in each case.

Dr. **FINISHED GOODS ACCOUNT** *Cr*

19..		Silks.	Cottons	Woollens.	19..		Silks.	Cottons.	Woollens.
Nov. 15	To Stock of Finished Goods on Hand ..	500	420	1,543	Nov 22	By Stocks on Hand . .	470	600	1,340
„ 22	„ Cost of Manufacture per Manufacturing A/c. .	610	1,453	672		„ Trading Account . .	640	1,273	875
		£1,110	£1,873	£2,215			£1,110	£1,873	£2,215

TRADING ACCOUNT

Dr. **FOR WEEK ENDING 22ND NOVEMBER, 19..** *Cr.*

19..		Silks.	Cottons	Woollens	19..		Silks.	Cottons.	Woollens.
Nov. 22	To Manufacturing Cost of Goods Sold .	640	1,273	875	Nov 22	By Sales	750	1,500	1,120
„ „	„ Gross Profit carried to Profit and Loss A/c.	110	227	245					
		£750	£1,500	£1,120			£750	£1,500	£1 120

Dr. **PROFIT AND LOSS ACCOUNT** *Cr*

19..		Silks.	Cottons.	Woollens.	19..		Silks.	Cottons.	Woollens.
Nov. 22	To General Expenses—				Nov. 22	By Gross Profit for Week .	110	227	245
„ „	„ Selling Expenses . . (specifically allocated in detail)	40	20	15					
„ „	„ Distribution Cost . (based on dissection of carriage a/c)	10	50	20					
„ „	„ Other Expenses . . (allocated on basis of cost of goods sold)	32	64	42					
„ „	„ Net Profit	28	93	168					
		£110	£227	£245			£110	£227	£245

This Production Record will give in detail the output of each department, the Total Works Cost or Cost of Production of which is represented by the net charges to the Manufacturing Account. This total will be transferred to Finished Goods Account ; and that account, after stock on hand is deducted, will show the cost of goods sold.

The average cost per unit in each department may be obtained weekly or monthly and will be a guide to cost of manufacture. This average will also be useful for checking the cost of any individual article or batch which can be computed in detail.

Administration Expenses.

These include—

SELLING EXPENSES—
- Commissions.
- Travelling.
- Advertising.
- Discounts.

DISTRIBUTION—
- Carriage.
- Branch Offices.

OFFICE EXPENSES—
- Salaries.
- Stationery and General Expenses.
- Audit Fees.

MANAGEMENT—
- Salaries
- Commissions.
- Directors' Fees.

DEPRECIATION—
- (Not charged to Factory.)

INTEREST ON LOANS

Expenses of general management embracing all the activities of a business may include several of the above headings. Such items may be apportioned if desired and to some extent covered by Works Overhead.

The allocation of management expenses between works and office must be arranged to suit circumstances. There can be no universal rules.

Allocation of administration expenses to lines of products or departments may be at a percentage on Works Cost (or upon the amount of sales) in each department with the exception that if any particular expense is incurred on behalf of any department (e.g. warehousing or interest charges upon special stores ; advertising), the allocation should be varied accordingly. This subject is considered in more detail in Chapter X.

EXAMPLE VII

Costa Manufacturing Company continue to manufacture their wireless set at a lower price and introduce a vacuum cleaner which is made in a separate department Their transactions for the year are as follows—

	Wireless.	Cleaner.
Materials purchased	£15,000	£1,550
Materials stock at year end	£600	£50
Wages	£7,200	£500
Works Expenses—		
Departmental	£4,400	£300
General, £600	two-thirds	one-third
Office Expenses—		
Departmental	£1,740	£1,000
General, £1,500	two-fifths	three-fifths
Sets made	1,200	500
Sets unsold	50	25
Sales	£32,760	£4,750
Sets in stock at commencement, 20	£500	—

Draw up their Accounts and show cost per article

MATERIALS ACCOUNT

Dr. *Cr.*

	Wireless.	Cleaner		Wireless.	Cleaner.
	£	£		£	£
To Purchases	15,000	1,550	By Stock	600	50
			,, Manufacturing A/c	14,400	1,500
	£15,000	£1,550		£15,000	£1,550

MANUFACTURING ACCOUNT

Dr. *Cr.*

	Wireless.		Cleaner.			Wireless.	Cleaner.
	£	each	£	each		£	£
To Materials used	14,400	£12	1,500	£3	By Finished Goods—		
,, Wages	7,200	6	500	1	1,200 Wireless Sets £22,	26,400	
,, Works Expenses					500 Vacuum Cleaners, £5		2,500
Departmental	4,400		300				
General	400	4	200	1			
	£26,400	£22	£2,500	£5		£28,400	£2,500

TRADING AND PROFIT AND LOSS ACCOUNT

Dr. *Cr.*

	Wireless.			Cleaner.				Wireless.			Cleaner.		
	No.	£	each £	No.	£	each £		No.	£	each £	No.	£	each £
To Stock	20	500	25	–	–	–	By Sales	1,170	32,760	28	475	4,750	10
„ Manufacturing Account completed Sets	1,200	26,400	22	500	2,500	5	„ Stock	50	1,100	22	25	125	5
„ Office Overhead—													
Departmental		1,740			1,000								
General		600			900								
per set sold (1,170)			2										
per cleaner sold (475)			–			4							
„ Net Profit—													
£1 per set: 20 sets		4,620			475								
£4 per set: 1,150 sets			4										
£1 per cleaner: 475 cleaners						1							
	1,220	£33,860	£28	500	£4,875	£10		1,220	£33,860		500	£4,875	£15

EXAMPLE VIII

The following is a summary of the expenditure of a business, viz.—

	£	£
Materials consumed		2,500
Direct Wages—		
A Department	1,200	
B Department	800	
C Department	1,000	
		3,000
		5,500
Overhead—		
A Department	1,800	
B Department	600	
C Department	500	
		2,900
Manufacturing Cost		8,400
Selling, Delivery, and General Administration Charges	840	
Carriage Outward	150	
Royalties	75	
Bad Debts	80	
Discounts allowed to customers	500	
		1,645
		£10,045

Prepare the cost of an article of which—

	s.	*d*
Direct Wages—		
A Department costs	12	–
B Department costs	14	–
C Department costs	16	–

and the material cost of which is £2 10s Provide 5s. for Royalty and 10s for carriage outward: 10 per cent for discount and 10 per cent for net profit.

ANSWER

Cost of Article

	£	s.	d.	£	s.	d.	£	s	d.
Material							2	10	–
Wages—									
Department A		12	–						
Overhead 150%					18	–			
Department B		14	–						
Overhead 75%					10	6			
Department C		16	–						
Overhead 50%					8	–			
	£2	2	–	£1	16	6			
Wages							2	2	–
Overhead							1	16	6
Manufacturing Cost							6	8	6
Selling Overhead—10%								12	10
Carriage								10	–
Royalty								5	–
							7	16	4
					s.	d.			
Discount—10% on Sale Price					19	6½			
Profit —10% on Sale Price					19	6½			
							1	19	1
							£9	15	5

No provision for Bad Debts.

Note. 20% on Sale Price = 25% on Cost.

CHAPTER V

PROCESS COSTS

PROCESS Costing is used to ascertain the cost of each stage of manufacture where material is passed through various operations to obtain a final product or result; with by-products in many cases at different stages.

Process Costing is used in Chemical Works, Refineries, Food Producing Factories, Dyeworks, Bleaching and Finishing Works, and the Textile Industries generally.

In these accounts the object is to arrive at the results at different stages of manufacture for comparison and pricing purposes. An account is required for each stage, which is debited both in quantity and in values with material in hand and fresh material. It is credited with by-products. These accounts may be kept by means of a separate set of cost books; these will tally closely with the financial books and will contain the same records arranged in a different form. In that case these will be memorandum accounts, agreeing with the financial accounts but not part of the double entry system.

Similarly wages are analysed into corresponding stages and expenses (both Process Expenses and Indirect Works Expenses) apportioned on the same plan. The cost of the process is then shown by a compilation of these three sources of information, taking into account the quantity of the product obtained, which in the intermediate stages passes forward to the next process.

Indirect expenses will either be definitely process expenses, such as Heating, Repairs, Power, associated with one or more processes or operations and chargeable specifically thereto; or belong to General Works Overhead, e.g. management salaries, when division between processes may be determined on a wages or quantity basis.

By-products are credited to the process in which they are produced and it will be found that, if the value of by-products is less than the cost of original material, as is often the case, the cost of the resulting product is thereby greatly increased. Thus the cost of the process does not only consist in the running expenses but in the loss in weight when the final product is recovered.

EXAMPLE OF PROCESS COST ACCOUNT FOR WORKS EMPLOYING CHEMICAL PROCESS

THE SWAN OIL REFINERY, LTD.

REFINING ACCOUNT FOR WEEK ENDING 7TH JANUARY

Dr. CRUSHING ACCOUNT *Cr.*

	Tons	£	s	d		Tons	£	s.	d.
To Kernels	1,000	30,000	–	–	By Crude Oil to Refining A/c.	500	28,675	–	–
„ Wages		400	–	–	„ Cake to Cake Sales A/c	400	2,000	–	–
„ Power & Steam		150	–	–	„ Sundry Sales A/c (Bags, etc).		100	–	–
„ Repairs & Stores		50	–	–	„ Loss	100	—	–	–
„ Rent, Rates, & Expenses		175	–	–					
	1,000	£30,775	–	–		1,000	£30,775	–	–

Dr. REFINING ACCOUNT "A" *Cr.*

	Tons	£	s.	d.		Tons	£	s	d.
To Crushing A/c	500	28,675	–	–	By Finishing A/c	450	28,520	–	–
„ Sundry Materials		250	–	–	„ Sundry Sales A/c Residual Oils and Fats	40	800	–	–
„ Wages		120	–	–	„ Loss in Process.	10	—	–	–
„ Power and Steam		135	–	–					
„ Rent, Rates, & Expenses		140	–	–					
	500	£29,320	–	–		500	£29,320	–	–

Dr. REFINING ACCOUNT "B" (FINISHING) *Cr.*

	Tons.	£	s.	d		Tons.	£	s.	d.
To Refining A/c "A"	450	28,520	–	–	By Sales Account	447	31,900	–	–
„ Wages		125	–	–	„ Sundry Sales	2½	45	–	–
„ Barrels		3,000	–	–	„ Loss in Process.	½	—	–	–
„ Power & Steam		200	–	–					
„ Rent, Rates, & Expenses		100	–	–					
	450	£31,945	–	–		450	£31,945	–	–

	Total Cost.	Process Cost.
	£ s. d.	£ s. d
Cost of Raw Material	30 – – per ton	
,, Crushing Process		27 7 – per ton
,, Crude Oil	57 7 – ,,	
,, Refining Process		6 – 6 ,,
,, Refined Oil	63 7 6 ,,	
,, Finishing Process		7 19 10 ,,
,, Finished Oil	71 7 4 ,,	

A modification of this plan is necessary where a stock account is required for partly manufactured material at each intermediate stage; and in this manner the method shown may be adopted for obtaining the average cost of manufacture of articles which are not entirely identical; the average cost is useful for comparison from one period to another and serves to check the detailed estimates of individual costs where allowances will be required for greater or less expense of manufacturing a particular type according as the size or complexity of the type in question exceeds or falls below the average.

An example of a Process Cost Account is given below for ascertaining and comparing cost of manufacture in the case of a business making a Standard Article by repetition work in a series of well defined stages: as in the manufacture

WEEK ENDING_____

No. 1. PROCESS—STAMPINGS

	No. of Completed Parts.	Value.		Cost per Unit.	No. of Completed Parts.	Value.
		£		d.		£
To Material from Stores.		306	By Stock A/c—			
,, Wages		120	Cost each	4·25	30,000	531
,, Expenses per Charges Allocation (= 87 5% on Wages)		105				
		£531				£531

No. 1. STOCK ACCOUNT

		£		d.		£
To Stock of Stampings	1,150	25	By Process No. 2 A/c		28,000	500
,, Process A/c	30,000	531	,, Stock c/fd. @ 4·25d.		3,150	56
	31,150	£556			31,150	£556

No. 2. PROCESS ACCOUNT

ASSEMBLING AND TESTING

		£		d.	£	£
To Stock A/c	28,000	500	By Stock A/c		25,000	994
,, Material from Stores		200	,, Sales of Scrap		500	5
,, Wages		250	,, Work in Process		2,500	81
,, Expenses (= 52% on Wages)		130	,, Cost of Process	5 3		
	28,000	£1,080	Cost each	9 55	28,000	£1,080

No. 2. STOCK ACCOUNT

		£		d.	£	£
To Stock of Assembled Fittings	50,000	2,000	By Process No. 3 A/c		40,000	1,598
,, Process A/c	25,000	994	,, Stock c/fd.		35,000	1,396
	75,000	£2,994			75,000	£2,994

No. 3. PROCESS ACCOUNT

FINISHING

		£		d.	£	£
To Stock A/c	40,000	1,598	By Finished Stock A/c		40,000	1,723
,, Packing		20				
,, Wages		75	,, Cost of this Process	8		
,, Expenses (= 40% on Wages)		30				
	40,000	£1,723	Cost each	10 35	40,000	£1,723

SUMMARY OF PROCESS ACCOUNTS

	No. 1 Process.	No. 2 Process.	No. 3 Process.	TOTAL.
To Work in Process (if any)	—	—	—	—
,, Material	£306	£200	—	£506
,, Stock Accounts	—	cr £31	£604	£573
,, Waste	—	cr £5	—	cr. £5
,, Wages	£120	£250	£75	£445
,, Expense	£105	£130	£50	£285
	£531	£544	£729	1,804
Less Work in Process car. forwd.	—	£81	—	£81
Gross Cost	£531	£463	£729	£1,723
No. Completed	30,000	25,000	40,000	40,000
Cost each	4·25d.	5·3d.	·8d.	10·35d.

METHOD OF VALUATION OF WORK IN PROCESS

WORK-IN-PROCESS No 2 PROCESS ACCOUNT

= Material (2,500 Parts in process)	£700 × 2,500 / 27,500	= £63
= Wages and Expenses (2,500 Parts in process taken as 1,250 parts completed)	£380 × 1,250 / 26,250	= £18
		£81

of brass incandescent gas burners by stamping; assembling and testing; and finishing departments.

In compiling the Process Accounts shown each of the items will be made up by grouping the separate expense charges concerned; to facilitate accuracy and uniformity these expenses dissections should be carefully defined and standardized by means of Expense numbers or cost numbers for the main headings, and with sub-numbers for detail divisions; and under these numbers the wages and materials are most conveniently dissected.

This method will facilitate the handling of the expense items; and also form a very suitable basis for instituting the use of the Sorting and Tabulating machines. The totals of wages and subdivisions to Cost Nos.; and totals of weekly Stores Issues with dissection under Stores Accounts Nos., and (after re-sorting) under Cost Nos. can be promptly obtained and posted with a minimum of clerical work and delay.

Gas Works Accounts.

The following outline shows a form of accounts where there are a number of valuable products obtained from the treatment of waste material. The difficulty that specially arises in these accounts is that a value has to be placed upon material for which there is no market price, and a further difficulty in accounting for the quantities used occurs where solids are converted into liquids, or gases or liquids re-converted into solids. The use of standard formulae based on the normal product of each process makes this possible.

Gas, Coke, and Residual Products

Pro forma Account, illustrating stages of manufacture and expenses charged at various stages—

TRADING ACCOUNT FOR_____

	£	s.	d.		£	s.	d.
To Carbonization A/c				By Sales of Gas			
„ Purification A/c				„ Sundry Income			
„ General Expenses— Classified under distinguishing heads				„ Profit on Sales of— Dehydrated Tar			
				Benzol			
				Sulphate of Ammonia, etc.			

Manufacture of Gas

CARBONIZATION ACCOUNT

	Tons.	£	s.	d.		Tons	£	s.	d.
To Coal used					By Coke & Ashes sold				
„ Wages— Retort House					„ Tar and Liquor A/c				
„ Repairs, Renewals, and Maintenance.					„ Trading A/c— Cost of Gas made				

PURIFICATION ACCOUNT

	£	s.	d.		£	s.	d.
To Lime used				By Sales of Spent Oxide			
„ Oxide used				„ Trading A/c			
„ Wages							

BY-PRODUCTS

TAR AND LIQUOR ACCOUNT

	Tons.	£	s.	d.		Tons.	£	s.	d.
To Carbonization A/c Value of Tar and Liquor made					By Crude Tar sold				
					„ Liquor sold				
					„ Tar Dehydration A/c				
					„ Motor Benzol A/c				
					„ Sulphate of Ammonia A/c				

UTILIZATION OF BY-PRODUCTS

DEHYDRATED TAR ACCOUNT

	Galls.	£	s.	d.		Galls.	£	s.	d.
To Crude Tar used					By Sales of Dehydrated Tar				
„ Cost of Steam Fuel, Wages, and Maintenance									
„ Profit and Loss A/c.									

MOTOR BENZOL ACCOUNT

To		Galls	£	s	d	By		Galls	£	s	d
Crude Material						Sales of Motor Benzol					
,, Wages											
,, Stores											
,, Maintenance											
,, Profit and Loss A/c.											

SULPHATE OF AMMONIA ACCOUNT

To		Tons	£	s	d	By		Tons.	£	s.	d.
Crude Material						Sales of Sulphate of Ammonia					
,, Sulphuric Acid											
,, Wages											
,, Stores											
,, Maintenance											
,, Profit and Loss A/c											

Pottery Costs.

In the case of the pottery trade the costs consist of the ascertainment of the cost of output from a series of departments which may be regarded as processes in the course of manufacture. The first series consists of preparation of the clay and the moulding; second, the baking in the kiln; next, the printing process, where the pattern is put on; a second baking process and possibly a second decorating or enamelling process and a third baking. In the preparation departments the cost of clay must be first arrived at; then the different groups of products can be charged directly with the wages upon them. This will ensue also in the printing and decorating departments. In the baking processes the cost of heating the kiln will be ascertained and charged against the actual pottery which has been baked at a time. The pottery is packed in "saggers" for the purpose of baking, and the correct charging and heating of the kiln determines whether the pottery will be correctly baked, as if there are defects in the heating, etc., it is not uncommon for the whole of the batch to be spoilt. The expense occasioned therefore by defective work is a considerable source of loss, and the

charge resulting under this head is one of the important features which should be revealed by costs.

The costs will naturally take the form of independent calculated costs, but the financial accounts should be so arranged that the expense of each process can be separately shown, and the quantity of articles turned out can then be used to compare averages with the calculated costs.

EXAMPLE IX

Costa Manufacturing Co. institute a chromium plating process to suit the needs of both departments. The process shows the following results at the year end—

	£
Materials used	400
Wages	800
Works Expenses —	
Departmental	500
General	300
Hours in operation	2,000
Work done—	
Wireless parts	2,000 sets
Cleaner parts	1,500 sets

It has been ascertained that relatively the cost for wireless parts is one-quarter that of cleaner parts per set. Show the cost of the process.

PROCESS ACCOUNT

	£		Cr £
To Materials	400	By Cost of Process—	
,, Wages	800	2,000 hours = £1 per hour	
,, Works Expenses—		2,000 Wireless Sets (equivalent of 500 Cleaner sets)	500
Departmental	500	1,500 Cleaner Sets	1,500
General	300		
	£2,000		£2,000

Cost per wireless set . 5s.
Cost per cleaner set . £1.

EXAMPLE X

The cost of a plating process is found to be 1s. 6d. per lb. of articles treated when materials cost £450, wages £200, and overhead expense £100. What will be the increase in the cost of the process if materials advance in price 40 per cent, wages 25 per cent, and process expenses 20 per cent?

ANSWER

Dr. PROCESS COST *Cr.*

	Present	Future		Present	Future
	£	£		£	£
To Materials	450+40% =	630	By Cost of Output—		
,, Wages	200+25% =	250	10,000 lb. @ 1/6	750	
,, Overhead	100+20% =	120	10,000 lb. @ 2/-		1,000
	£750	£1,000		£750	£1,000

EXAMPLE XI

A manufacturing process formerly produced a waste material. A method has been found to make this material usable in another process. Illustrate the effect upon the accounts concerned.

ANSWER

Standard Material

PROCESS 1

Dr. (Preparatory) *Cr.*

			Old Method	New Method
	£		£	£
To Process Material	50	By Cost of Output		
,, Process Wages	75	of Process	150	50
,, Process Expenses	25	(Cost reduced)		
		,, By-product to Process XY.	—	100
	£150		£150	£150

PROCESS 2

Dr. (Finishing) *Cr.*

	Old Method	New Method			
	£	£		£	£
To Process Material	100	100	By Cost of Finished Material (Cost reduced)	380	280
,, Process No. 1: Intermediate Product	150	50	,, Waste (if any)	?	
,, Process Wages	80	80			
,, Process Exps.	50	50			
	£380	£280		£380	£280

New Material

Dr. PROCESS XY *Cr.*

	£		£
To Process Material	70	By Cost of Output of New Process	350
,, By-product of Process 1	100		
,, Process Wages	105		
,, Process Expenses	75		
	£350		£350

The benefit arising from the value of the by-product reduces the cost of the output from the process where it originates.

CHAPTER VI

TEXTILE ACCOUNTS—PROCESS COST METHOD

PROCESS Cost methods are adopted in the textile industries, the cost per lb. of yarn or per yard or per piece of cloth being ascertained.

Spinning Mills.

The cost divides itself into two parts—

(*a*) Cost of cotton (or other material) :

(*b*) Cost of wages and expenses.

The average cost of cotton will be found from the periodical Trading Accounts, which should be set out to show net consumption per lb. of yarn produced.

The cost of cotton enters into Manufacturing Cost apart from initial cost price on account of—

(1) Waste in processes—diminished by value of waste sold ; and

(2) Loss by weight in processes through drying—diminished by subsequent absorption of moisture by the yarn.

An advance in price of cotton therefore means an enhanced increase in cost of production of yarn.

The fineness of yarn is measured in counts, the counts being the number of hanks (of 840 yards) contained in 1 lb. of yarn ; so that the cost of cotton per lb. of yarn shown in the Trading Account will be the average cost, or the cost for the average counts produced by the mill. Finer yarns will entail more waste as well as different mixings, so that the cost for each count requires separate investigation based on calculation and test.

The cost of wages and expenses is seen in total in the Trading Account and the cost per lb. yarn for average counts should be shown there.

There is a difficulty in applying Process Cost methods from the fact that the material is continually in process, but the production at each stage is obtained for payment of wages—piece rates being universal.

Wages and production are thus obtained in processes, and works expenses can be apportioned similarly by careful analysis.

The expense cost varies with different counts of yarn produced, according to—

(1) Processes required to produce particular counts ;

(2) Production of machinery on different counts ;

(3) Effect on mill production as a whole, which may be increased or reduced with variations from the standard for which the plant is best adapted.

Textile Processes.

In framing the Financial Accounts a clear division should be made between raw material, material for various expenses accounts, productive wages and indirect wages, and other expenses ; and these expenses should be further divided to separate works expenses from office and selling expenses. At monthly periods a balance of the financial accounts should be made so as to ascertain the expenses of the month for comparison purposes. The first view that is obtained, therefore, month by month, of the accounts of the business will be in the form of a Trading Account. Where the stocks are not actually taken the values of these must be calculated from the Stores Records and estimated amounts of material in process.

The second step that should be taken is to separate the main processes that are carried on so as to obtain an expense allocation for each stage. The whole of the expenses should be dissected so far as possible directly against one or other of these sections, and such expenses as cannot be separately charged must be allocated on a fair basis. There will be obtained a series of accounts for the different stages of manufacture, and the number of lbs. of yarn

spun, the number of pieces of cloth woven, and the number of pieces finished can be used as a basis for calculating the cost in each process per unit. Up to this point the system that is carried on is entirely in accord with the financial accounts, and the records will be made up month by month,

COTTON SPINNING MILL.

SPINNING ACCOUNT FOR HALF-YEAR ENDING 30TH JUNE

Dr. *Cr.*

	lbs	£	s.	d	per lb		lbs.	£	s.	d
To Consumption of Cotton—						Sales of Yarn				
Purchases						*Add* Stock 30th June				
Stock 1st Jan.										
Less Stock 30th June						*Less* Stock 1st Jan				
Less Waste Produced—						Loss in Weight				
Sales										
Stock, 30th June										
Stock 1st Jan										
„ Wages and Expenses at Mill—										
Productive Wages										
Other Wages										
Rent, Rates and Insurance										
Power										
Heating and Lighting										
Stores										
Repairs										
Depreciation										
Other Expenses										
Office and General Salaries and General Expenses										
Balance Net Profit										

so as to contain a continuous series of records for comparison.

The average costs are thus shown in the Trading Account, and a similar statement of average Production Cost may be prepared week by week from Wages, Production and Expense Records. Detailed costs for particular yarns are then ascertained by calculation and test based upon these statements.

SPINNING MILL.

COST STATEMENT FOR WEEK ENDING_____

	Wages Paid.	Expense Apportionment	Production lbs.	Cost per lb.
PRODUCTIVE WAGES—				
Preparation				
Carding				
Draw Frames				
Intermediate				
Roving				
Overlooking				
And so on				
NON-PRODUCTIVE WAGES—				
Warehouse and Engineers				
Management and Office Salaries				

Total Wages_____ Production in Hanks_____

Expenses _____ Average Counts_____

Net *Weight* Yarn produced_____

Total Cost per lb. Yarn_____

MANUFACTURING ACCOUNT.

FOR THE HALF-YEAR ENDING_____

	£	s	d.	Percentage to Production		£	s	d
o Consumption of Yarn					By Production of Cloth			
Stock 1st Jan					*Add* Stock 30th June			
Purchases								
					Less Stock 1st Jan.			
ess Stock 30th June								
o Weavers' Wages								
Other Productive Wages								
Mill Expense—					SUMMARY OF EXPENSE—			
Staff Wages						Total.		
Rent and Rates						£	s. d	%
Power								
Stores and other Mill Expenses					Wages			
Office Expenses					Expense			
Gross Profit								

Weaving Mills.

A similar analysis of the Trading Account, together with a Weekly Wage and Expense Report, showing cost per yard or piece of cloth, can be prepared for the manufacturing department. The wages are paid at piece rates

and a percentage on weaving wage is added to cover Production Expense.

WEAVING MILL

COST STATEMENT FOR WEEK ENDING_____

OPERATIONS.	Total Wages Paid	Expense Apportionment.	Production lb of Yarn or Pieces of Cloth.	Cost per lb. Yarn or per Piece of Cloth.
Productive Wages—				
Winding				
Warping				
Sizing				
Twisting				
Weaving				
Overlooking				
And other operations				
Non Productive Wages—				
Warehouse and Engineers				
Management				
Office and Salesmen				

Weavers' Wages £_____ Preparation Cost . _____d per lb. Yarn

Other Wages £_____ Weaving Cost . _____d per Piece.

Other Expenses £_____ Indirect Cost . _____d per Piece.

Average of Total Cost . . per Piece.

Percentage of Expense to Weavers' Wages_____

To carry the detail of costs further than this, each of the departments already specified must be further subdivided so as to ascertain, as regards the running expenses, the approximate cost of running each machine or group of machines in the factory. The works expenses must be allocated in detail on the methods explained in the chapter on Factory Expenses, so as to place upon each machine its fair share of the burden. The office expenses will not be computed in this manner, as they are only chargeable on finished goods, and are not added to the value of these until they are sold. The cost of running each machine having been ascertained, the number of hours that it is expected to be working must be estimated, and the total expenses divided by the total hours gives the estimated amount per hour that the machine will cost to run.

Date.

Particulars of Cloth.

Pieces

Process.	Colours.	Other Material.	Wages.	Power and Steam.	Overhead	Total.	Cost per Piece			
							Colours.	Wages.	Power.	Overhead.
Total										

Summary

Other Works Charges.

The above Cost Sheet records the expense of dyeing individual lots through different processes. The detail of material and wages of workmen are recorded on the reverse side.

PROCESS COST—DYEWORKS

SUMMARY OF COST.

Month Ending _____

Total Pieces _____

Process.	Hours Worked	Pieces dealt with	Pieces per hour	Manufacturing Cost			Overhead	Total Manufacturing Cost per Piece.	Overhead per Piece.	Total Works Expense	Total per Piece.
				Colours.	Wages	Power and Steam					

SUMMARY OF OVERHEAD.

Rent and Rates				Manufacturing Cost.
Staff				Overhead.
Repairs				Other Expenses—
Depreciation				Carriage
Other				Discounts.
TOTAL				
Cost per Piece				

The method of obtaining detail costs will then be for the material which will be required to produce a given quantity of the cloth in question (allowing for waste and loss of weight) to be priced out according to the known cost of material at the market price of the day.

The direct wages will be known, as these are payable at piece-work rates. The working expenses of the departments at the rate obtained in the most recent monthly accounts must be added, or alternatively, the rates of the different machines for the time that will be required to be devoted to the work must be totalled in the case of special work which is different from the average product. To the total thus obtained must be added the rate of expense for office charges, carriage to customers, discounts and commissions to salesmen.

Dyeworks.

In the accounts of dyeworks and similar businesses, where the original value of the material treated does not enter into the accounts, the process cost is confined to recording the cost of the dyes and other materials, wages and running expenses. A separate Cost Sheet is used for each lot of work done, which shows the individual expense for each process; and a monthly summary giving the totals of the individual Cost Sheets must be set off against the expenses shown in the financial books.

For each department, in all textile as in other businesses, an expense rate per direct labour hour, or machine hour rates for each machine should be obtained and checked from time to time. The expense rates will be reliable for detailed estimating and costing; and will provide a standard for comparisons.

EXAMPLE XII

A manufacturer has three distinct processes in connection with the same unit. The Cost Sheet is prepared for the processes as follows, but this is not correct, and it is desired to show the cost of each process—

		Total	Cost per Unit: 42,000 Completed Units
		£	
Direct Wages—Process A. . . .	£450		
Process B. . . .	150		
Process C	175		
		775	4·4 pence
Materials to Process A—36,000 units cost . .		3,150	18 ,,
Department Expenses—Process A . .	£225		
Process B . .	200		
Process C . .	350		
		775	4·4 ,,
Factory Overhead		1,050	6 ,,
		5,750	
Cost of completed Units (stated to be) . .			32·8 pence

Quantities handled are as follows—

	Process : A	B	C
Commencing Stock (units). . .	9,000	20,000	10,000
Received.	36,000	36,000	48,000
	45,000	56,000	58,000
Delivered	36,000	48,000	42,000
Waste, etc.	1,000	2,000	2,000
Closing Stock on hand . . .	8,000	6,000	14,000

Factory Overhead is divisible over processes in proportion to output; finished output of each process is delivered daily to next process, and there is no material partly processed; stocks in each process may be taken at the cost price of material received.

Answer

Process A

	Units	*d.*	£	*s.*	*d.*		Units	*d.*	£	*s.*	*d.*
To Stock	9,000		787	10	–	By Cost of Output	36,000	27·5	4,212	10	–
,, Received	36,000	21	3,150	–	–	,, Spoilt Work	1,000	·6			
,, Wages		3	450	–	–	,, Stock	8,000		700	–	–
,, Departmental Expense		1·5	225	–	–						
,, Factory Expense		2	300	–	–						
	45,000	27·5	£4,912	10	–		45,000	28·1	£4,912	10	–

Cost of Process if output perfect, 27·5d. Actual cost £4,212 10s. ÷ 36,000 = 28·1d.

Process B

	Units	*d.*	£	*s.*	*d.*		Units	*d.*	£	*s.*	*d.*
To Stock	20,000	28·1	2,341	–	–	By Cost of Output	48,000	31·8	6,601	8	4
,, Received	36,000		4,212	10	–	,, Spoilt Work	2,000	1·2			
,, Wages		·7	150	–	–	,, Stock	6,000		702	1	8
,, Departmental Expenses		1	200	–	–						
,, Factory Expense		2	400	–	–						
	56,000	31·8	£7,303	10	–		56,000	33·0	£7,303	10	–

Cost of Process if output perfect, 31·8d. Actual cost £6,601 8s. 4d. ÷ 48,000 = 33d.

Process C

	Units	*d.*	£	*s*	*d.*		Units	*d*	£	*s.*	*d.*
To Stock . . .	10,000	33	1,375	–	–	By Cost of Output . .	42,000	38	6,926	8	4
,, Received . . .	48,000		6,601	8	4	,, Spoilt Work . .	2,000	1·6			
,, Wages . . .		1	175	–	–	,, Stock . . .	14,000		1,925	–	–
,, Departmental Expenses		2	350	–	–						
,, Factory Expense .		2	350	–	–						
	58,000	38	£8,851	8	4		58,000	39·6	£8,851	8	4

Cost of Process if output perfect, 38d. Actual cost £6,926 8s. 4d. ÷ 42,000 = 39·6d.

CHAPTER VII

JOB COSTING—TERMINAL COSTS

TERMINAL Costs are employed to show the cost of carrying out contracts and undertakings which are by their nature entirely separate and are terminated by the completion of the work.

The accounts of a builder and contractor present the best illustration in simple form of the methods adopted in Job Costing. Under this system the object is to arrive at the profit or loss on each contract. The greater part of the work is estimated for, so that the price is fixed in detail in advance; other work is done by day work, and it is then no less important to ascertain the exact cost.

TIME SHEET

Week ending.....

Name of Employee..... No..... Trade.....

Job Name and No.	Time Worked.						Total.	Rate.	
	Sat	Mon.	Tues	Wed	Thur.	Fri.			£ s. d.

WAGES ABSTRACT

JOINERS.

Week ending _____

Job No.____			Job No.____			Job No.____			Job No.____			Job No.____		
No.	Hrs.	Amount.	No.	Hrs.	Amount.	No.	Hrs.	Amount.	No.	Hrs.	Amount.	No.	Hrs.	Amount.

Final Summary.

Joiners.

Job No. _____

_____

_____

_____

EXPENSES

Staff.	£	s.	d.	Transport.	£	s.	d.	Stores.	£	s.	d.

STORES LEDGER

Article .. .. Minimum Stock..... ....

No..... Maximum Stock..... ...

Dr. *Cr.*

Date.	Supplier.	Quantity.	Price.	£	s.	d.	Date.	No of Requisition.	Quantity.	£	s.	d.	Balance. Quantity.	£	s.	d.

The method will bring the Contract Ledger, in which the accounts of the different jobs are contained, into the double-entry book-keeping system, and thus ensure that the results obtained will be actual financial results. The use of an independent Cost System, which is necessary where the number of individual cost accounts to be kept is very much greater, can be dispensed with in businesses of this type. In the Contract Ledger an account will be opened for each job undertaken, and there will be a series of jobbing accounts for different types of jobbing work, so that the results of each group will be separately ascertained. The Sales Ledger will not be interfered with, but, on the completion of each job, the amount of the contract will be credited to the Contract Account and debited to the Customers Sales Ledger Account.

Wages.

The wages are dealt with in the first place on daily or weekly time sheets, which are utilized in making up the total wages due in the Wages Book for the purpose of paying wages ; and the gross wages are then analysed in a Wages Abstract for the purpose of charging up to the contracts or to Expenses Accounts for indirect labour. (See pp. 59 and 60.)

A separate abstract will be used for plumbers and another for bricklayers in a similar manner. The grand total will include staff wages not chargeable to any particular contract, and will be agreed with Wages Book Totals, and the total of each column in the abstract will then be posted to its appropriate Contract Account in the Contract Ledger and the staff wages and time spent on work chargeable to Expense Accounts (e.g. repairs) will be posted to the Nominal Ledger.

Material.

Materials for contracts include special purchases and supplies from stores.

The dissection in the Purchases Analysis Book will separate these two groups and will classify stores purchases as joiners', bricklayers' or plumbers' material and under these headings the Stores Accounts will be arranged.

Special purchases will be posted direct from Purchases Analysis Book to Contract Account; the total amount of purchases for stores will be posted to debit of Stores Accounts in the Nominal Ledger under above classification.

Stores Accounts should be kept in a Stores Ledger which contains records of all building material. A separate account is required for each article, and this is debited

ISSUE NOTE FOR STORES

Date .... Stores Ledger Fo.....
Contract Ledger Fo. .....

Required for Job. No..... ..

Name.....

@ £ s d.

Authorized by Received by

with quantity and value of (1) Balance in Stock; (2) all purchases subsequently, irrespective of the source of supply; it is credited with stores issued to Contracts or Jobbing Accounts, or used in repairs, etc., work and chargeable to Expense Accounts.

The stores are issued to contracts only against Issue Notes prepared in the office, which are entered in a Stores Issued Book on presentation at the stores.

The materials used must be priced at cost.

The posting of the Contract Ledger should be made from the Stores Issued Book; or a Stores Summary; or a journal entry comprising the totals of the summary; and the total of the amounts debited to the Contract Accounts should be credited to the Stores Account in the Nominal Ledger; this account will show at any time the book value of the

STORES ISSUED BOOK

Date.	No. of Contract.	Name.	Requisition No.	Details.	Folio.	Quantity.	Amount.			Joiners.			Bricklayers.			Plumbers.		
							£	s.	d	£	s.	d.	£	s.	d.	£	s.	d.

stores in hand, which should agree with the total of the list of balances taken out from the Stores Ledger. The Stores Ledger Accounts should naturally be checked at short intervals with the actual stocks held. Any shortages of materials, unless these can be traced to jobbing work, must be charged to Stores Adjustment Account as an Expense item.

The Contract Ledger Accounts must be credited with any stores returned, posted from a Stores Returned Book, or entered at the end of the week or month in the Stores Issued Book as a deduction.

PLANT. The value of plant sent to the site should be charged to the Job Account. In connection with long contracts there will be considerable depreciation in the value of the plant, and it is important that the contract on which this occurs should be fully charged with such loss. In the Nominal Ledger an account should be opened for Contract Plant, and a list of plant available should be kept, each item having its value shown, and the total agreeing with the book value shown by this account. When any plant is charged to a job, the Contract Plant Account must be credited, and when on the completion of the work the plant is returned, the Job Account will be credited with the estimated value, and the Contract Plant Account will be debited. In the event of such plant being sold the credit will go directly to the job concerned. In this way each job will be made to bear the full cost of the use of plant.

SUB-CONTRACTS are debited in the same way as direct purchases, being charged to jobs in the Contract Ledger direct from the Purchases Analysis book.

Disbursements on account of particular contracts are dealt with by posting direct from Cash Book or Petty Cash Book to Contract Ledger.

Expense.

Total expenses, including foremen's salaries, office salaries and expenses, insurance, rent and rates, cartage,

advertising, repairs and depreciation, will be grouped in an Expense Allocation Account and apportioned to contracts at stocktaking times.

Alternatively a definite scheme for charging Overhead Expenses to the contracts can be prepared, and the appropriate charges made to each job when the work is finished and the Contract Account closed. A method often adopted which is not, however, sufficiently accurate is to charge a percentage on the outlay on each job ; seeing that some contracts will consist mainly of material and others will have a small proportion for material and a larger amount for wages, thus entailing more expense in supervision and probably also being in hand for a longer period, it follows that a flat rate on both material and labour will not give a fair charge to each job, tending to overcharge the jobs on which the material forms the larger portion of the outlay. It will be found by a close analysis of expenses that the wages should bear a heavier rate than material. The correct charges to place upon material are those which are entailed by the buying, warehousing and handling of the Stores. The total annual expense for these services can be obtained by analysis of the Financial Accounts, and, by dividing this proportion over the material, a percentage can be fixed as a Warehousing Rate. Other expenses, including general management, may be sufficiently accurately proportioned as a percentage paid on the wages of each job. Where there is a joinery department fitted with woodworking machinery it may be desired to have special hourly rates for the use of the different machines. For the purpose of fixing these rates the following expenses in connection with the machines should be omitted in fixing the general overhead rates, and should be allocated specifically to each machine, and then the total of the burden on each divided by the total estimated hours it will work, gives the machine hour rate. The charges to be included are the depreciation and repairs for the machine ; the cost of power to run it ; the proportionate share of the

CONTRACT LEDGER

Dr. Contract No. 152_____ Name_____WILLIAMS F R. _____(Joiner's Work.) *Cr.*

Date.	Details.	Fo.	Direct Purchases. £	s.	d.	Fo.	Stores. £	s.	d.	Date.	Wages. £	s.	d.	Total. £	s.	d.	Date.	Details.	Fo.	£	s.	d.
19.. Oct. 5	To Subcontract . .	4	52	7	4	15	125	4	–	19.. Oct. 1	25	–	–				19.. Oct. 31	By Contract .		350	–	–
	„ Sundries . .					24	18	10	–	8	24	–	–									
	„ do. . .					35	5	4	–	15	26	7	–									
										22	10	4	–									
			52	7	4		148	18	–		85	11	–	85	11	–						
	„ Direct Purchases													52	7	4						
	„ Stores . .													148	18	–						
	„ Expenses at 20% on Wages . .										17	2	–									
	„ 10% on Material .										20	2	6									
														37	4	6						
														324	–	10						
	To Profit carried to Profit and Loss Account													25	19	2						
														350	–	–				350	–	–

Columns may also be provided for " Plant supplied to contract " and " Plant returned."

space occupied covering rent and rates, lighting, heating, cleaning of the workshop; and, if it is desired to cover the annual cost of the money locked up in the machines, the normal rate of interest on the capital value of each should be brought into account.

Journal Entries.

Under this system the Contract Ledger becomes an integral part of the double-entry book-keeping system. A monthly Journal entry in the following form will serve to focus the Contract Ledger entries for posting to the Nominal Ledger.

Sundry Contracts *Dr.*
To Special Purchases.
Materials per Stores Issued Book.
Sub-Contracts.
Productive Wages.
Chargeable Expenses.

Sundry Contracts *Dr.*
To Expense Allocation Account
for proportion of General Expenses
charged to Jobs.

Expense Allocation Account *Dr.*
To Sundry Expenses—
Office Salaries
Rent and Rates
for Expenses actually incurred
during the month,
etc.

Value of completed work is similarly credited to contracts and debited to customers.

Sundry Customers *Dr.*
To Sundry Completed Contracts.

In this way each Contract Account becomes a separate Trading Account, showing its own profit or loss; and balances are transferred to General Profit and Loss Account.

PURCHASES ACCOUNT (JOINERS)

Dr.								Cr.		
19..		£	s.	d.	19..		£	s.	d.
Jan. 1	To Balance of Stores in Stock	960	–	–	Jan. 31	By Stores Issued Contracts	370	–	–
,, 31	,, Purchases	740	–	–	Feb. 28	,, ,, ,,	950	–	–
Feb. 28	,, ,,	780	–	–	Mar. 31	,, ,, ,,	740	–	–
Mar. 31	,, ,,	1,975	–	–	,,	,, Jobbing Account	1,975	–	–
					,,	,, Stock on Hand	420	–	–
		£4,455	–	–			£4,455	–	–

CONTRACTS ACCOUNT
THREE MONTHS ENDING 31ST MARCH, 19..

Dr.								Cr		
		£	s.	d			£	s	d.
Mar. 31	To Losses—				Mar 31	By Profits—			
	Joiners					Joiners			
	Contract No. 143	35	–	–		Contract No 152	25	19	2
	Plumbers (if any)					,, ,, 262	15	–	–
	Bricklayers					,, ,, 135	24	–	–
,,	,, Net Profit	274	–	–		Bricklayers :			
						Contract No. 126	36	–	–
						,, ,, 134	15	–	–
						,, ,, 155	23	–	–
						Plumbers :			
						Contract No. 128	25	–	–
						,, 130	15	–	10
						Profit on Jobbing Account—			
						Joiners	50	–	–
						Bricklayers	60	–	–
						Plumbers	20	–	–
		£309	–	–			£309	–	–

JOBBING ACCOUNT (JOINERS)

Dr.								Cr.		
19.		£	s.	d	19..		£	s.	d.
Mar. 31	To Stores Supplied	1,975	–	–	Mar. 31	By Sundry Customers per Day Book	3,025	–	–
,,	,, Wages	700	–	–					
,,	,, Expenses	300	–	–					
,,	,, Net Profit	50	–	–					
		£3,025	–	–			£3,025	–	–

EXPENSES ALLOCATION ACCOUNT

Dr.								Cr.		
19..		£	s.	d.	19..		£	s.	d.
Mar. 31	To Staff Wages	500	–	–	Mar. 31	By Contracts per Journal	730	–	–
	,, Rents and Rates	120	–	–		,, Balance to Jobbing Accounts—			
	,, Cartage	65	–	–		Joiners	300	–	–
	,, Office Expenses	250	–	–		Bricklayers	100	–	–
	,, Insurances	75	–	–		Plumbers	25	–	–
	,, Advertising	20	–	–					
	,, Interest	15	–	–					
	,, Repairs	30	–	–					
	,, Depreciation	80	–	–					
		£1,155	–	–			£1,155	–	–

SUMMARY OF CONTRACTS

No.	Name	Work in Progress Forward			Special Material			Stores Materials			Wages			Overhead			Plant Account			Profit			Loss			Work in Progress			Sales		
		£	s.	d.	£	s.	d	£	s.	d.	£	s	d.	£	s.	d.	£	s.	d.	£	s.	d	£	s	d.	£	s.	d.	£	s.	d.
152	Williams . .				52	7	4	148	18	–	85	11	–	37	4	6				25	19	2							350		–
126	Brown . . .	125	5	–				422	10	–	251	5	–	92	10	–	30	–	–	36	–	–							957	10	–
143	Jones . . .	340	15	–	15	–	–	140	5	–	120	10	–	38	2	6							35	–	–				619	12	6
	Other completed Jobs and Jobbing Accounts (detailed) . . .	1,220	9	8	214	5	–	5,460	19	6	1,942	5	–	801	6	3	110	–	–	247	–	10							9,996	6	3
	Various Jobs in Progress (detailed) . . .	524	10	–	152	10	–	624	7	6	540	15	–	185	16	9	150	–	–							2,177	19	3			
		£2,210	19	8	£434	2	4	£6,797	–	–	£2,940	6	–	£1,155	–	–	£290	–	–	£309	–	–	£35	–	–	£2,177	19	3	£11,923	8	9

Totals agree with Nominal Accounts and furnish details for General Trading Account for the period

Dr. TRADING ACCOUNT *Cr.*

6—(B 1765)

	Joiners £	Others £	£	s.	d.		£	s.	d.
To Work in Progress			2,210	19	8	By Sales	11,923	8	9
,, Special Materials			434	2	4	,, Work in Progress	2,177	19	3
,, Stores Materials—									
Stock at commencement	960	510							
Purchases	3,495	2,724							
	4,455	3,234							
Less Stock at end	420	472							
	4,035	2,762							
			6,797	–	–				
,, Wages			2,940	6	–				
,, General Expenses—									
Staff Wages		500							
Rent and Rates		120							
Cartage		65							
Office Expenses etc.		250							
			1,155	–	–				
,, Plant Account			290	–	–				
,, Profit per Contracts Account			274	–	–				
		£	14,101	8	–	£	14,101	8	–

Where the work is done under Architects' Certificates, the amount of each may be credited as the work proceeds.

The Contracts and Jobbing Accounts should bear similar charges for expenses.

Uncompleted work must be valued as Work-in-Progress. This may be taken at cost of outlay, that is, material plus labour, and the current percentage may be added for expenses. When the method is preferred of only charging expenses to the jobs as they are completed, the amount of establishment charges on Work-in-Progress must be reserved for by debiting a Suspense Account when making up the periodical accounts. No profit must be taken credit for, nor must the full value be allowed to stand if there is any reason to suppose that the work cannot be completed for the contract price. An exception arises in the case of long contracts extending over several years, where a fair profit must be estimated as the work proceeds.

A safe profit in such cases may be estimated at two-thirds of the profit shown on the basis of the value certified for by the architect's certificate, where payment is received on this basis, the balance of one-third being reserved against unforeseen difficulties in completing the work.

Where only a portion of the value of the work done is paid as the contract proceeds the profit on the unpaid portion should be further reserved.

Machinery and Plant are recorded in classified accounts in the Private Ledger, and suitable depreciation is written off year by year.

It is an advantage to divide the closing accounts into—

Joiners' Contracts ;

Bricklayers' Contracts ;

Plumbers' Contracts ;

and to show the profit (or loss) on Jobbing in each department. For the purpose of this analysis, some contracts will require to be divided when the final result is obtained.

The amounts due from customers are shown in the Sales Ledger to the debit of personal accounts. In the

case of Jobbing work, the entries come through the Sales Day Book (analysed to show the three departments separately). In the case of contracts the Contract Journal contains the entries debiting the customer and crediting the Contract Accounts.

Payments on account of contracts will consequently be posted to the Sales Ledger Accounts.

EXAMPLE XIII

Prepare a Job Account in the Cost Ledger for the following items appearing at stocktaking date—

JOB X2745 (*Jones Engineering Co.*)

	Mar. 10	Mar. 17	Mar. 24	Mar. 31
	£	£	£	£
Direct Wages—				
Bricklayers	150	100	60	30
Joiners	75	80	85	70
Plumbers	40	20	10	—
Painters, etc.	54	40	60	30

	£
Special Materials	1,250
Stores Issued	748
Plant	100

Works Overhead, 75% on Direct Wages.
Office Overhead, 5% on Works Cost.

1. State how the double entry in relation to these items is completed in the Cost Ledger.

The contract is for £8,000 and the work is half completed. The sum of £4,000 less 10 per cent retention money has been paid. There is unused material £200 and plant £80 to be taken into consideration.

2. Calculate the profit to date and estimate the amount to be taken credit for after allowing adequate reserve for contingencies.

ANSWER

COST ACCOUNT

JOB X2745 (*Jones Engineering Co.*)

		Brick-layers	Joiners	Plumb-ers	Painters, etc.	Special Materials	Stores	Plant	Over-head	Total
		£	£	£	£	£	£	£	£	£
Mar. 10	Wages	150	75	40	54					319
,, 17	Wages	100	80	20	40					240
,, 24	Wages	60	85	10	60					215
,, 31	Wages	30	70		30					130
		£340	£310	£70	£184					904
	Special Materials					1,250				1,250
	Stores Issues						748			748
	Plant							100		100
	Works Overhead, 75% on £904								678	678
										3,680
	Office Overhead, 5% on £3,680								184	184
										3,864
	Profit and Loss Account—Estimated Profit to date (see page 75)									250
										£4,114

ANSWER

Dr. WAGES ACCOUNT *Cr.*

			£
Mar. 10	By Wages	Job X2745 .	319
,, ,,	,, ,,	Other Jobs .	—
,, 17	,, ,,	Job X2745 .	240
,, ,,	,, ,,	Other Jobs .	—
,, 24	,, ,,	Job X2745 .	215
,, ,,	,, ,,	Other Jobs .	—
,, 31	,, ,,	Job X2745 .	130
,, ,,	,, ,,	Other Jobs .	—

Dr. SPECIAL MATERIALS *Cr.*

		£
Mar. 31	By Job X2745 . .	1,250
,, ,,	,, Other Jobs . .	—

Similarly each Nominal Account will be credited with weekly total amounts charged in costs (including items for Job X2745).

CALCULATION OF ESTIMATED PROFIT ON JOB

	£	£
Total Outlay to date		3,864
Deduct Plant	£80	
,, Stores	200	
	—	280
		3,584
Value of Work completed		4,000
Apparent Profit to date . . .		416
Deduct Reserve for Contingencies, one-third of £416 .		139
		277
Reserve further 10% on account of Retention . .		27
Profit to take to Profit and Loss Account .		£250

PART II
ENGINEERING COSTS

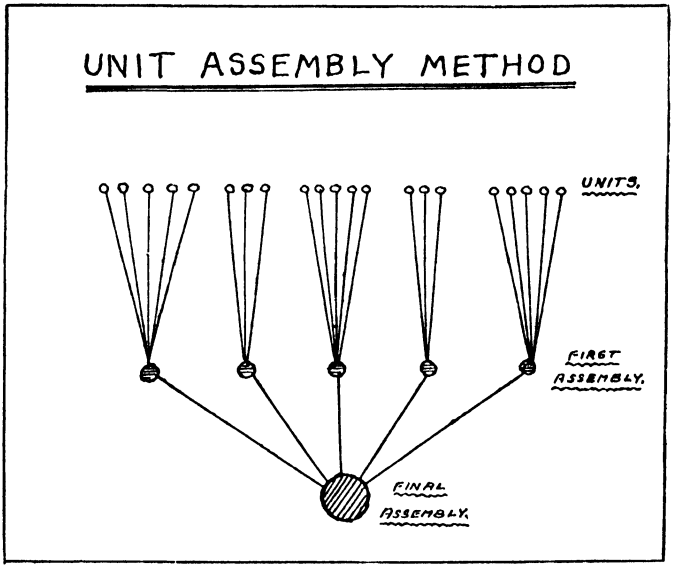
THE study of Job Costs necessitates the consideration in detail of a large range of very different circumstances embracing, naturally, the whole of the operations of every kind of factory. It is essential that detailed records should be made of every step in the production of any article, and the records of material used and time occupied must be made in such a way as to reduce the clerical work involved, while at the same time enabling the Cost Department to turn out a complete and accurate record of the cost of the work.

For the purpose of organization complicated work will be split up, and each section put in hand separately. Cost records will be kept to correspond and the final summary of all the sectional costs will give the total for the complete job.

The necessity for a separate system of accounts distinct from the financial accounts will thus be apparent, and it is naturally important that details which are being entered in the cost accounts should be co-ordinated with the records of the financial books, as they are being entered up week by week, to produce the Profit and Loss Account at the end of the year.

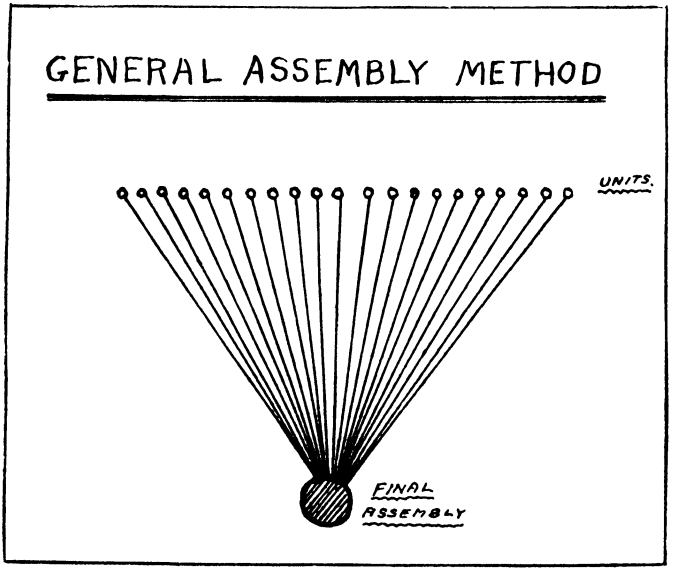
This reconciliation can be maintained by strict regard to the harmonizing of the nominal accounts in the financial books with the Cost Department classifications. Groups of accounts may be arranged to correspond in both systems, and the reconciliation then becomes automatic.

The description of works routine in Chapter XIII may be usefully read at this stage or referred to in studying the following chapters.



UNIT COST PLUS COST OF ASSEMBLING = SPARE PART COST

SPARE PARTS PLUS COST OF FINAL ASSEMBLY = TOTAL COST



CHAPTER VIII

MULTIPLE COSTS—LABOUR

MULTIPLE Costs apply to businesses where the products differ widely in type, value and complexity; where similar operations may be used to give widely differing ultimate results; where specialization and the standardization of parts may be extensively adopted.

The application of Cost Accounts to businesses of this type usually follows the Job Cost system, with variations in sections of the works to which special methods are applicable.

The object aimed at is to ascertain the actual cost of execution of each order as it is completed, and to obtain this the detailed dissection of all outlays is unavoidable; this entails considerable clerical work.

The cost divides itself again into Labour, Material and Expense.

Labour.

METHODS OF PAYMENT—

(1) Time Rates.
(2) High Wage Plan.
(3) Piece Rates—with guaranteed wage. "Straight" or "Differential."
(4) Bonus Methods—
"Premium Bonus"; "Efficiency Bonus."
(5) Output Bonus.
(6) Profit Sharing.

TIME RATES, are essential where work cannot be standardized or classified into suitable classes or grades for piece rating; and where special care and skill are essential.

Formula. Hours Worked × Rate per Hour.

This is the simplest method of remuneration, but is open to much abuse unless the supervision is efficient.

HIGH WAGE PLAN. This plan proceeds on a time rate or day wage, but the rate is increased 40 to 50 per cent above district rates for similar work, with the object of securing the higher skilled men, and inducing them to use every ounce of effort, and at the same time maintain the highest possible standard.

PIECE RATES are satisfactory, provided the rates are correctly fixed at the outset.

Formula. Number of Pieces × Piece work rate.

DIFFERENTIAL PIECE RATE. This method gives extra percentage after a certain quantity is exceeded.

Formula—

Earning up to task.	Number of Pieces × Low Piece Rate.
Earning above task.	Number of Pieces × High Piece Rate.

MERRICK MULTIPLE PLAN. This is really a Differential Piece Work plan.

Formula—

Earning up to 83% of Task.	No. of Pieces × Basic Piece Rate.
Earning 83% to 100% of Task.	No. of Pieces × 2nd Piece Rate.
Earning 100% and above.	No. of Pieces × 3rd Piece Rate.

In the original plan the second Piece Rate was 10 per cent higher than the first, and the third was 10 per cent higher than the second. It has been claimed that probably no plan has such a steadying influence as this one because it is equally fair to the beginner (who is given encouragement right away) as it is to the most expert, who is rewarded according to his skill.

BONUS METHODS. Many types of Bonus Methods have been devised to stimulate production and encourage employees to earn more than average wages, and at the same time to obviate the tendency on the employer's side to cut rates by combining a benefit to the employer with the workmen's bonus; this being achieved by the reducing cost per unit to the employer, along with an increasing bonus and rate per hour to the employee.

PREMIUM BONUS. The most common plans are the Halsey-Weir and the Rowan Plans.

Under the Halsey-Weir plan the time rate is guaranteed.

A standard time task is set and the employee completing the job within the time allowed receives a percentage of the time saved (usually 33⅓ to 50 per cent) in addition to his day rate.

Formula. Time Wages plus percentage of hours saved.

Example.	Time allowed . . .	10 Hours.
	Time taken . . .	6 Hours.
	Bonus percentage . .	50%
	Rate per hour . .	20 pence.
Earnings		
	Time worked . . .	6 Hours.
	50% time saved . .	2 Hours.
		8 Hours × Rate per Hr.

Earnings 13s. 4d.

The Rowan system also guarantees time rate. The chief variation from the Halsey-Weir, however, is that the percentage of time saved to time allowed is added on to the hourly rate.

Formula. Time Wages plus per cent hours saved to time allowed × Time Taken.

Example.	Time allowed . . .	10 Hours.
	Time taken . . .	6 Hours.
	Rate per hour . .	20 pence.
Earnings.		
	Time Worked 6 Hours × 20d. plus 40%, i.e. 6 × 28d. = 14s.	

A Premium Bonus plan can be most beneficially introduced where any difficulty is experienced in fixing accurate rates. Up to a time saving of 50 per cent the Rowan is in favour of the workman as compared with the Halsey-Weir, and beyond this figure the Halsey-Weir is more beneficial to the worker. The Rowan plan is a greater protection to the employer, for, although up to 50 per cent of time saved the workman receives a greater bonus than under the Halsey-Weir, beyond this point the bonus falls away in the same ratio in which it rose, so that no worker can double his wages at the expense of the employer owing to an error in the rate fixing.

Other Premium or Variable Sharing plans are—

BARTH PLAN.

Formula. Square Root of (Time allowed × Time taken) × Rate per hour.

This plan was devised for the encouragement of new employees or for the commencement of new work for which there had been no previous experience to guide the management to fix standard rates.

COST PREMIUM SYSTEM.

Formula. Percentage of saving on Prime Cost in addition to Time Rate.

This system combines a saving in time with a saving in the materials, and is only recommended where expensive materials are being worked, and where it is essential that scrap should be avoided.

STINT SYSTEM. A standard task is set and immediately the task is accomplished the workman goes home.

Though actually no bonus is paid, the workman receives the equivalent—time.

GANTT SYSTEM. A standard is set, and, if the workman achieves the standard he receives a bonus of, say, 40 per cent. In addition sometimes his foreman also receives a bonus, with the object of stimulating efficient supervision.

BAUM MULTIPLE PREMIUM. This is a three rate plan based upon the Halsey principle. A task is set and the standard is such that ordinary day work would represent about 66 per cent of the task.

Formula—

66% Task . .	. Hours actual × Rate per hour (Day work).
66% to 100% Task	. Halsey Formula.
100% to 111% Task	. Halsey Formula with slight increase in Hourly Rate.
111% Task upwards	. Halsey Formula with still further increase in Hourly Rate.

Though this example only shows three rates, as many as five different rates are in use in some factories, and the task percentage limits are varied accordingly.

DIEMER PREMIUM BONUS.

Formula—

Earning up to task .	. Day Work.
Earning at and above task	. Time Wages plus 20% plus half of savings on task.

BEDAUX POINT PREMIUM PLAN. This scheme guarantees time wages up to a high task, and when the task is achieved gives a constant sharing, which is usually distributed 75 per cent to the employee and 25 per cent to the supervisory force. All work is standardized per unit of time; in this case one minute. The work expected in one minute of time after due allowance for fatigue, etc., is called the Bedaux Point or "B." One "B," therefore, represents "the effort developed by an average person working under normal conditions at a normal rate of effort for one minute of time."

The task is carefully set, so that usually 60 "B's" are task, and 80 "B's" are considered reasonable from the more efficient employees.

Excepting for the high task level, it is the Halsey-Weir plan with a 75 per cent bonus for the operator and 25 per cent bonus for supervision.

An unusual feature of the plan is a sheet showing number of points produced and premium earned by each operator, which is posted daily in the respective department. This introduces the production control plan which is the ultimate object of the system besides that of enabling the employees to earn bonus commensurate with their efforts. For instance, the number of "B's" produced by individuals or machines is posted daily alongside the number of "B's" standard. The supervisors can tell instantly which operators are below standard. Recapitulation sheets, either weekly or bi-weekly, enable the superintendents to compare the efficiencies of the supervisors or departments.

The management then have a reliable bird's-eye view of production, and can apportion praise or blame accordingly.

In favour of the Bedaux System it may be said—

(1) Being based upon efficiency, it means a thorough overhauling of the activities of the company.

(2) Since Day Work is guaranteed, only bad or inefficient employees are penalized.

(3) Individual effort is rewarded and every encouragement is given to each employee to give of his best.

(4) The automatic speeding up must tend to reduce cost per unit without penalizing the employees' earnings.

(5) Continuous vigilance of operator, supervisor, and service tender is assured, since all partake of the bonus.

(6) Indirect labour and material control sections are raised to a higher state of efficiency.

(7) The hidden menace to new operators of favouritism by foremen is eliminated, since each operator is rewarded on his merit and his performance recorded.

(8) The diminution of waste and full control of idle and waiting time must contribute in no small measure to the general efficiency of the business.

Against the Bedaux System it may be said—

(1) Past efficiency may be penalized. A department which is highly efficient at the time of introducing the "B" point will not gain so much as a department which may have been inefficient.

(2) To reduce activities to a "Minute" base may be too searching, and savours of "grinding efficiency" reducing the operator to the level of a machine.

(3) The recording of performances daily may be resented by efficient workers who, through temporary indisposition, are scheduled as inefficient; and sooner or later they will abandon the race for efficiency points, as being suicidal.

(4) The installation of the system calls for a very considerably increased clerical staff.

(5) There may be antipathy towards the granting of 25 per cent of the savings to the supervisory force.

(6) Difficulty may also arise on account of Trade Union objections; severe strain on individuals; and cost of installation.

EMMERSON EFFICIENCY SYSTEM. This system gives the worker a graduated rate of bonus, commencing at 5 per cent if output is 65 per cent of efficiency standard, and advances by steps to 40 per cent when the 100 per cent efficiency is reached. This is a modification of the Taylor Efficiency Plan

which gave only a large bonus to the workmen performing 100 per cent of a very exacting task.

PARKHURST EFFICIENCY BONUS. Under this system the worker gets a bonus upon the attainment of 70 per cent of efficiency. A sliding scale of bonuses is compiled after due regard to the varying difficulties and responsibilities of the work irrespective of the men who may do the jobs. A "Parkhurst Differential Bonus Pay Chart" is compiled showing the Bonus Classes, say, from 1 to 10, and the bonus payable upon reaching the varying percentage of efficiency in any one of these classes.

OUTPUT BONUS. The Priestman Plan is typical of the Output Bonus. The scheme is to classify all work completed and total weekly the gross production by weight, or by measurement of volume in points. The standard weekly output is agreed upon between employer's and men's representatives, and is subject to increase or decrease if the number of employees or working hours are increased or reduced. Bonus is then paid to every employee at the rate of increase of output over standard.

PROFIT SHARING schemes have for their object—

(1) Stimulating of employees' interest in the business ;

(2) Ensuring mutual oversight to eliminate waste (both of time and material) ;

(3) Improvement of methods by utilizing employees' ideas ;

(4) Retaining services of employees by giving them a permanent standing as part proprietors.

The drawbacks to such schemes usually lie in—

(*a*) The payments being too far apart ;

(*b*) Bonus being too small to exercise a sufficiently strong influence ;

(*c*) The idea that proprietors gain more from the extra efforts of the workpeople under the scheme than is given in bonus ;

(*d*) Inability of employees to obtain access to the accounts ;

EXAMPLE OF PREMIUM BONUS

"ROWAN" SYSTEM

Bonus being at same rate on wage earned as time saved is to time allowed—

Time allowed: 100 hours Wage: 2s per hour.	Time saved.	Per Cent.	Wage earned.	Bonus.	Total Wage.	Rate per Hour.	Employer saves on Job.
(*a*) Work completed in 80 hours . . .	20 hours	20%	£8	£1 12s	£9 12s.	2s. 4½d.	8s.
(*b*) ,, ,, 60 ,, . .	40 ,,	40%	£6	£2 8s.	£8 8s	2s. 9½d.	£1 12s.
(*c*) ,, ,, 45 ,, . .	55 ,,	55%	£4 10s.	£2 9s. 6d.	£6 19s. 6d.	3s. 1½d.	£3 0s. 6d.

ALTERNATIVE METHOD.

Bonus being a definite share of time saved, say 50 per cent—

Time allowed: 100 hours. Wage: 2s. per hour.	Time saved.	Wage earned.	Bonus = ½ Time saved.	Total Wage.	Rate per Hour.	Employer saves on Job.
(*a*) Work completed in 80 hours . . .	20 hours	£8	£1	£9	2s. 3d.	£1
(*b*) ,, ,, 60 ,, ...	40 ,,	£6	£2	£8	2s. 8d.	£2
(*c*) ,, ,, 45 ,, ...	55	£4 10s.	£2 15s.	£7 5s.	3s. 2½d.	£2 15s.

(*e*) Results being influenced by trading conditions which are beyond employees' control ;

(*f*) Objections to bonus distributions in the form of shares.

Under the Port Sunlight (Lever Bros., Ltd.) plan, employees of one year's service are entitled to participate in the distribution of co-partnership certificates, for the issue of which a fund is made available each year, depending on the profits earned. The distribution is made in three grades based on merit awards, and the bonus shares receive a rate of dividend at 5 per cent less than the amount of the dividend on the ordinary shares. There are restrictions on transfer.

Under the scheme initiated by J. T. and J. Taylor, of Batley, the employees receive a bonus annually out of profits available after paying a 5 per cent dividend on the share capital, the division of the surplus between shareholders and employees being in proportion to the capital employed and wages earned. There is provision in the scheme for additional bonus to employees who have been long with the firm, and the bonus may be invested in the company's shares.

Numerous other similar profit sharing schemes are in operation, having in most cases special features to suit local circumstances.

With modern accounting methods providing monthly Profit and Loss returns the objections to such plans can be reduced.

Profit Sharing Schemes and Output Bonuses are in the form of *group* bonuses ; the gross results are used to determine the rate payable to the individual. This plan is not considered economically sound by many works managers on the ground that each man should have the benefit of his own skill and effort to induce him to do his best work ; and that none should benefit unless he has earned the bonus with his own labour. At the same time the different methods are suitable under varying circumstances, and in

some cases it is group organization which produces maximum output rather than individual skill.

A plan successfully adopted in connection with revisions of Piece-work Rates provides for the consideration of these by a joint committee of management and employees' representatives with the object of securing that any rate which is found by a workman to be inadequate shall be inquired into and be adjusted if shown to be too low. Similarly appeals by the management for revision of too liberal rates are considered, with the proviso that no rate will be reduced without a corresponding increase being given to a low rate.

With the idea of encouraging interest in a profit sharing scheme the monthly Balance Sheet and Trading Account described in Chapter XI may be used, and it seems likely that this method of accounting will remove one of the principal objections to profit sharing schemes in making a monthly ascertainment of bonus possible.

Wage Records.

ENGAGEMENT OF LABOUR. For the engagement of employees a history card should be prepared setting out full details of the employee's record, trade, etc., and this card should be retained for the purposes of recording advances of pay, etc., so long as the employee remains with the firm. Each employee should be given a number which will correspond with the department where he will work, so that his department can be readily seen from the pay roll number.

TIME RECORDING. It is essential for the record of time spent in the works to be correctly obtained, and for this purpose a time-keeper is usually provided with either a time board on which each man can hang a brass check, or a time recorder clock in which each man can place his time card for the time of commencing and leaving to be mechanically recorded, as in the Gledhill-Brook system. There is a certain saving in clerical work in the use of

mechanical time recorders, but the presence of a time-keeper when recording is in progress is essential to prevent wrong use of the clock by workmen registering the time of others who are late or absent. The total time provided by the time-keeper's book from time board or that recorded by the time recorder on the time card will be used for making up wages for day-workers, and will be checked off for piece-workers with the time booked on individual piece-work notes. (See Time Sheet and Wages Book, pages 59 and 60.)

PIECE-WORK NOTES. Where payment at piece rates is in operation it is preferable to have a system of piece-work notes, by which the time spent on each job is recorded upon a separate note, in order to ensure the correct booking of time on each job. There are many other advantages obtained from the elasticity of method resulting when each item of the wages dissection is recorded on a separate job note, even when day rates are in force. The Time Sheets or Job Notes should be certified by the foreman in charge.

PAY ROLL. The Pay Roll is made up from the gross time records, with in the case of the piece workers the summaries of the Piece-work Notes. A coin summary should be made at the foot of each Pay Roll Sheet showing the amounts required in £1 notes, 10s. notes, silver and copper, to pay out exactly the wages on that sheet. This makes the counting out much simpler and helps in tracing errors. For compiling the Pay Roll a convenient method is the use of the Burroughs Wages Adding Machine, with which an operator can tabulate the Pay Roll with great rapidity, giving at the same time an automatic check on the additions and deductions. The calculating machine is used for reckoning piece-work prices, bonuses and bonus additions to wages; and the adding machine summarizes the job notes of each workman, to obtain his total pay.

The method of summarizing wages illustrated on page 60 has been superseded in many offices by the introduction of adding machines for the purpose. The job notes after the completion of the Pay Roll are sorted into order of

Jobs and Expense Numbers and listed, so as to give the total for each job or expense item with a grand total which

PIECE-WORK NOTE

Workman's No.	Works Order No. ....
Name	
Rate	....
Date commenced	Time . . . .
Part .	Price
Operation	Checked

No. Off.	Passed.	Rejected.	Inspected by

Time.			Works Expenses.	Week ending			
Day.	Hours.	Over-time.	Shop Rate .... Machine No. .. .. Machine Rate..	Value of P.W. Price Overtime Bonus . .	£	s.	d.
Total Time				Total Wage . .			

Foreman's signature ....

agrees with the total wages of the Pay Roll. A considerable amount of clerical work is saved by this means. Where there is a large number of employees and the works is consequently divided up into separate shops, each shop requires to be dealt with separately as a distinct unit by means of a Shop Pay Roll and a Shop Wages Abstract. A final summary of such Shop Wages Abstracts is then required either by tabulating the dissections in

columnar form, giving the Shop Wages vertically and the charges to Jobs horizontally, or by mechanical summarizing methods. The saving of time and labour by the latter process is considerable.

A useful comparison may be made week by week of the percentage of indirect to direct labour. As indirect labour forms one of the main items of works expense, this percentage will give an advance indication of rise or fall in works expenses as a whole.

Extreme care in the payment of wages, so as to guard against irregularities, must be ensured by a sound system as well as by a reliable staff. The system must aim at placing responsibility upon several officials, who will check one another's operations.

The clerks engaged in making up the wages should not also pay out to the men. At the time of payment foremen who can identify the men should be present. The Pay Roll should be submitted to and signed by the manager.

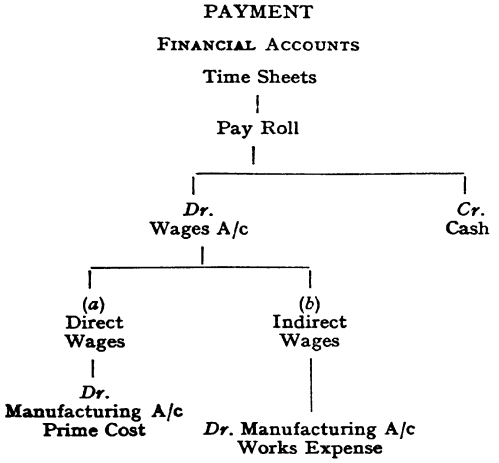
Advances to workmen (subs.) should be charged through Petty Cash and deducted in subs. column on Wages Sheets. Advances on I O U 's to workmen working at a distance should be refunded, and actual wages charged through Wages Sheet of outside staff.

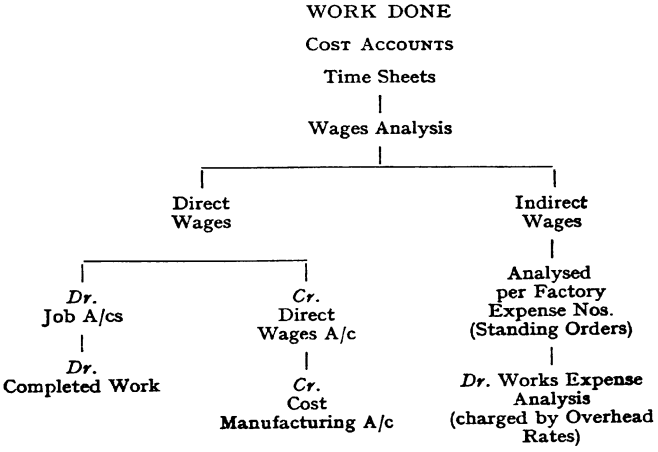
Decimal System of Time Recording

For some purposes it is found adequate to record time on jobs in tenths of an hour. For this purpose a time clock is used which gives a time record with six-minute intervals. The workman obtains the same time record on the job cards of both the new and the old job when changing over, and the calculation of time taken and wage is much simplified. The system is not suitable when more exact recording is required.

(See Chapter XIII regarding wages routine.)

WAGES


PAYMENT
Financial Accounts
Time Sheets
Pay Roll
Dr.
Wages A/c
Cr.
Cash
(a)
Direct
Wages
(b)
Indirect
Wages
Dr.
Manufacturing A/c
Prime Cost
Dr. Manufacturing A/c
Works Expense


WORK DONE
Cost Accounts
Time Sheets
Wages Analysis
Direct
Wages
Indirect
Wages
Dr.
Job A/cs
Cr.
Direct
Wages A/c
Analysed
per Factory
Expense Nos.
(Standing Orders)
Dr.
Completed Work
Cr.
Cost
Manufacturing A/c
Dr. Works Expense
Analysis
(charged by Overhead
Rates)

WAGES RECONCILIATION

1. FINANCIAL ACCOUNTS.

WAGES ACCOUNT

		£			£
Jan. 1	To Cash . . .	510		By Manufacturing A/c .	24,620
8	,, ,, . . .	505		(Direct Wages)	
15	,, ,, . . .	512		,, Repairs A/c . .	545
	Etc. . .			,, Sundry Indirect Wages	135
				,, ,, ,, ,,	25
		£ 25,325			£ 25,325

COST ACCOUNTS.

WAGES ANALYSIS PER TIME CARDS

(*a*) Direct Wages—			
Job No. 1	15		
,, ,, 2	4		
	—		
	—		
	—		
	—		24,620
(*b*) Indirect Wages—			
Repairs: Plant	315		
Tools	110		
—	—		
—	—		
	—		545
(*c*) Sundry Wages			135
Unaccounted for			25
Due to—			
Inaccurate time recording.			
Lost time cards.			
Calculation errors.			
			25,325

EXAMPLE XIV

Prepare a labour cost sheet for a machined component, with four operations, viz.—

Commenced with 150 parts:

Operation 1.	Piece rate	6d.	Scrapped . . .	5
,, 2.	,, ,,	1s. 1d.	Rejected for adjustment	10
,, 3.	,, ,,	1s.	Defective forgings .	4
,, 4.	,, ,,	6d.	Scrapped . . .	8

ANSWER

LABOUR COST SHEET

Operation No.	Process.	Quantity Issued.	Quantity Passed.	Piece Rate.	Earnings	Rejected.	Operation Loss.	Average Cost.	Remarks.
1	Turning . .	150	145	6d.	3 12 6	5	— — —	Pence 7· 0 7 3 2	
2	Boring . . .	145	135	1/1	7 6 3	10	6d 5 –	14· 2 6 8 3	
3	Planing . .	135	131	1/–	6 11 –	4	1/7 6 4	12· 7 8 0 5	
4	Slotting . . .	131	123	6d.	3 1 6	8	2/9 1 – 8	6· – – – –	
				3/1	£20 11 3		£1 12 –	40· 1 2 2 –	

	£	s.	d.
ACTUAL COST: 123 at 3s. 4·122d. =	20	11	3
STANDARD COST: 123 at 3s. 1d. =	18	19	3
LABOUR VARIANCE =	£1	12	

EXAMPLE XV

An employee working on straight piecework leaves a job uncompleted at the end of the week.

(*a*) Calculate his pay on the job to date.

	£ s. d.	£ s. d.
Piecework Price	7 10 –	
Completed—One-third		
Time on Job—30 hours.		
Rate, 47-hour week . . .		2 10 11
War Bonus, 47-hour week . .		10 –

(*b*) What would his pay be if the job is one-quarter finished?

ANSWER

	£ s. d.	£ s. d.
(*a*) One-third Piece Work Price . .		2 10 –
Day Work Earnings—		
30 hours at 50s. 11d. . .	1 12 6	
30 hours' Bonus . . .	6 4½	
	£1 18 10½	1 18 10½
Piece Work Bonus .		11 1½

11s. 1½d. is the maximum amount of bonus payable to the employee. It should be borne in mind that the actual payment of this premium is influenced by local conditions, some firms paying on Day Work only and crediting the Bonus until the completion of the job. Alternatively, some firms will pay the Bonus with a percentage deducted for any contingency, which will be paid out in full or adjusted at the completion of the job.

(*b*) Should the job be only one-quarter finished at the end of 30 hours, the firm would have to pay the Day Work Rate Earnings of £1 18s. 10½d., although the Piece Work Earnings *pro rata* would only be £1 17s. 6d.

CHAPTER IX

MULTIPLE COSTS—MATERIAL

Material.

THE lay-out of a factory necessarily demands suitable planning of the stores departments in relation to the work.

It is essential that there be—

(1) Rough Stores conveniently situated for the receipt of raw material;

(2) Components Stores for completed parts;

(3) Shipping Department for finished orders;

(4) Good general organization to save time in carrying work through; suitably placed departmental stores, tool stores, etc.;

(5) Efficient transportation.

Purchase Routine.

It is important to obtain a strict control of purchases in order to ensure that there is complete harmony as to prospective supplies between Stores Department and Buying Office and Contract Department who handle the orders received. To ensure this the Contract Department having prepared a complete specification on receipt of each order will circulate it, supplying one copy to the chief Storekeeper. On this he will indicate material available in his stores, and material not available which must be purchased. The specification is then returned to the Contract Office, who issue Purchases Requisitions to the Buying Department for items of which the supplies are running short, and advise Planning Department of manufactured Stock items required. The Stores Office will also perceive at any time from the records in the Stores Ledgers when the stock of any item is falling below its

fixed minimum, and a Purchases Requisition should be immediately sent to the Buying Office.

The minimum stock limit for any article will be determined by the rate of consumption and time required to obtain supplies. The ordering quantity will be a convenient size according to the terms of the market and rate of consumption ; and the maximum will usually be the same as the minimum plus ordering quantity.

In the case of components manufactured for stock the maximum of each will be fixed so as to prevent excessive quantities being put into stock, having regard to rate of manufacture of other components.

Receipt of Stores.

On receipt of goods the Storekeeper will record details of the material, quantity, quality, etc. It is preferable that quantities, etc., expected should not be advised to the Storekeeper in advance and the responsibility for checking invoices should rest with the Accounts Department and not with the Stores Department.

The Storekeeper will advise the Buying Office and Planning Department of goods received daily. The goods will be examined by the Inspection Staff and complaints reported. A daily Goods Received Sheet (with duplicates) or a separate Receiving Note for each item (with duplicates) is preferable to the use of bound books, on account of the greater ease with which carbon copies of the entries can be made and circulated to departments concerned. When books are used two sets will be required for use on alternate days.

The Buying Office will check details against invoice indicating whether the items are classed as Special Purchases or Stores Material and will insert correct Bin No. and price ; and then return the sheet to Stores Office for entry of debits of Stores Material to Stores Ledger.

In the case of Purchases for particular contracts the Buying Department will insert the number of the job on

the invoice. An extra copy of the Goods Received Sheet may be used to replace the entry of separate invoices in the Purchases Analysis, the Goods Received Sheet for this purpose being provided with a Cash Column and bound as part of the Purchases records. The total of the sheets will then be carried into the Purchases Analysis Book.

Stores Ledgers.

The detail work required to maintain a continual check upon the consumption of material may entail considerable clerical labour. It is useful for the following reasons—

(1) To control waste ;

(2) To safeguard against pilfering ;

(3) To assist Buying Department by providing records of quantities used ;

(4) To assist Stores Department in maintaining the minimum stock prescribed ;

(5) To provide means of taking an inventory without closing down the works.

The Stores Ledger may take the form shown on page 98, or a more elaborate ruling can be provided with detail for values, if desired.

The Stores Ledger should be under a separate control from the actual stores, as the Ledgers are for the purpose of a check upon the Storekeeper.

The best method to adopt with a view to saving duplication of records may be set out as follows—

The Stores Office should be adjacent to the main stores, having an independent head responsible for the accurate posting of the Ledger entries ; the Stores Ledgers being also readily available for reference by the Storekeeper.

The Stores Ledgers are most advantageously kept on the loose-leaf method and, if the entries are numerous, individual items may be entered in quantities only, the prices being noted to each item on the requisitions and the calculations being extended with the use of the calculating

STORES LEDGER

Article— .....

Minimum Stock.....

Maximum Stock.....

No. .....

.....

Dr. *Cr.*

Date.	Supply Invoice.	@	Quantity.	Date.	Req. No.	Quantity.	@	Balance.	Date.	Req. No.	Quantity.	@	Balance.	Date.	Req. No.	Quantity.	@	Balance.

machine by the Stores Section of the Cost Office. At the same time the extension of values in the Stores Ledgers is an advantage as a check upon

(1) The accuracy of the prices or calculations on the requisitions and

(2) Omissions or inaccuracies in the posting.

The Stores Ledger can then be balanced with a controlling Stores Account in the financial books. It is also possible in this event for the Stores Issues to be totalled (preferably by the adding machine) in the Stores Office before the Issue Notes are handed over to the Cost Department; then when the Cost Department have re-sorted and summarized the Issue Notes according to the jobs concerned, the total for posting to the jobs can be obtained and agreed with the Stores total to ensure accuracy in the routine. In order to reduce the amount of clerical work which is entailed in the keeping of Stores Ledgers on this plan when there are many thousands of individual entries required, the use of Ledger posting machines is an advantage, enabling the work to be done more speedily.

Where the Sorting and Tabulating Machines are in use the method adopted is to total the weekly issues on the Tabulator Sheet and post the total issues to each Stores Account. As the entries will be already sorted into correct order the posting can be rapidly done.

A Lot No. or Bin No. should be given to each article in stock. The number then ensures that the correct item will be understood whenever it is referred to.

The numbers should be arranged according to code so that the items indicated can be readily identified and an index will be maintained by the Stores Office and kept up to date.

The arrangements of the stocks in the Stores and of the accounts in the Stores Ledgers will follow the order of the Bin Nos.

An advantage from a complete Stores record of all purchases is found in having an index for future reference

containing details of all materials, parts, fittings, etc., that have been handled.

Bin Cards.

It is a frequent practice for the Storekeeper to have a card attached to each lot of stores, indicating the amount in stock. When further supplies arrive, the quantity received is noted in the " Received " column and, as the issues are taken from the bin, the quantity taken out is entered in the " Issued " column, and the third column will thus show the balance in stock. This is frequently a useful plan if the Stores Ledgers are not available for reference by the Storekeeper, or are not entered up daily so as to be always up to date. In some cases the bin cards are dispensed with as not serving a really useful purpose when the Stores Ledgers are promptly written up day by day.

BIN CARD

ARTICLE_____

BIN NO._____

Received_____		Issued_____								
Date.	Quantity.	Date.	Qty.	Bal.	Date.	Qty.	Bal.	Date.	Qty.	Bal.

Index of prices, including record of quotations as well as orders placed, should be kept in the Purchase Department.

Material Control Card.

Where Bin Cards are located in the Stores Office instead of in the actual bins, it is sometimes an advantage to augment the ordinary Bin Card by the addition of a column headed "Orders Placed." The Stores Manager can then see at a glance the actual and the anticipated movements of all material. By fully utilizing the "Delivery Specified"

column, he can ensure that production is not held up for lack of material. By an intelligent use of the card as a whole, the locking up of capital by carrying excessive stocks is eliminated. The card can be used as a Stores Record only without price columns when a record of prices is kept in the chief office or with price columns as shown in the example, page 111.

Stores Issues.

Issues of stores are made only against Issue Notes or Stores Requisitions.

Requisitions are of various types and should be distinguished by use of various coloured forms, e.g.—

(1) PRODUCTION ORDERS. These are supplies of Direct material for the manufacture of

(*a*) Customers' Orders ;

(*b*) Stock Orders for standard parts.

(2) TOOLS OR PATTERN ORDERS. These are supplies of Direct Material chargeable to Tools Orders or Patterns Orders for Tools or Patterns, either for special jobs or for general Tools or Patterns Renewals or Stock.

(3) REPLACEMENT MATERIAL FOR SPOILT WORK. Direct Material for Productive Work but chargeable to " Errors " or " Defective Work " Account instead of being charged to the job on which it is used.

(4) PLANT MAINTENANCE. Supplies of Material for Plant Repairs and Renewals chargeable to Expense Accounts.

(5) CONSUMABLE STORES. Supplies of Indirect Material chargeable to Expense Accounts, e.g. Oils and Lubricants, Waste, Canteen and Ambulance supplies.

The Planning Department, in conjunction with the Drawing Office, will issue, in respect of each Production Order, a full detailed Works Order with drawings, complete instructions, and Material specifications. Requisitions for such material may accompany the order or will be written out by foremen's clerks, and material will be

drawn from stores as required. The Storekeeper will retain the requisition, obtaining on it the workman's signature for the material issued; and will also enter the date of issue against the items concerned on the Material

WORKS ORDER

Number of Order.	Date issued to works.	Date promised for delivery.

Particulars

Drawing No.	Quantity.	Quality.	Finished Weight.	Office Advised.	Examined by.

Material required.

specification, which should be presented to him at the same time.

In departments where work is of a repetition character, foremen will prepare their own requisitions for supplies to keep their machines running.

Sundry stores for general consumption, e.g. oil and lubricant, will be requisitioned by the foremen.

Tools are issued against deposit of requisition or tally by the workman requiring them, who will be responsible for their safe return, when the requisition or tally will be surrendered in exchange.

It is essential that there should be perfect co-ordination between the Tool Room and the Wages Office, so that no workman can be paid up until all tools on loan are accounted for. The following form is used for this purpose.

TOOL CLEARANCE TICKET

To the Wages Office.

The Tools booked out on Loan to ....
Check No. . .. ...

(*a*) Have been returned.
(*b*) Have not all been returned. There is still outstanding ... .
valued at . . ..

Please withhold Money and Cards until returned.

Date . (Signed) . . . .
Tool Store Superintendent.

Pricing Stores Requisitions.

The Stores Ledger will record the purchase price of each item of goods received, the information being obtained from the Buying Department entries upon the Goods Received Sheets. These prices should be the actual cost prices delivered at works, any trade discounts being deducted and freight, Customs duty, carriage and similar charges added. The Stores Requisitions will ordinarily be priced at the cost price of the earliest purchase which remains unexhausted. Where the stocks have been written down, the reduced price must be recorded on each Stores Ledger Account, and this will be the figure for pricing subsequent issues.

In cases where frequent purchases are made of the same articles, e.g. bolts and nuts, it may be impossible to keep accurate record of the issues made from each purchase, and where the prices are varying the plan to be adopted is to average the cost price of the stock on hand at monthly intervals and use the price so fixed as the value for the ensuing month.

To find average cost price, the quantities at each price must be totalled, and thus the average cost of the whole quantity will be obtained.

Transfers of Material from One Job to Another.

The accuracy of Cost Accounts is very frequently upset because of the transfer of material from one job to another,

and difficulties arise where the practice is frequent. As it is not advisable to consider clerical difficulties when the question is really one of hastening forward the completion of an urgent order, cases will always arise where material is transferred from one job to another to oblige a customer who is pressing strongly for delivery.

In order to keep the costs correctly the details of the material or parts transferred and Jobs concerned should be recorded on a Material Transfer Note, which is handed in at the end of the day through the Stores Department to the Cost Office, and the item will then be transferred from one job to the other in the Cost Books.

MATERIAL RETURNED TO STORES. The Storekeeper will receive with all surplus material returned to Stores a "Stores Credit Note," which will be similar to a Stores Requisition but of a different colour. These Stores Credit Notes will be passed through the Stores Ledger and to the Cost Office for credit to the job concerned and will be deducted from the total of Stores Issues in making up the periodical summary.

All material returned as represented by the "Material Returned to Stores" Note should be entered in the "Received" column of the Bin Card to *contra* the "Issue" entry. To omit this causes discrepancies between the balance shown on the Bin Card and the actual physical contents of the bin.

Stocktaking.

Where a satisfactory system of Stores Accounts is kept, the annual stocktaking can be dispensed with. The Stores Accounts should then be under the supervision of the Accounts Department, and the actual stock should be checked continuously by an independent stocktaker, who will report daily to the Accounts Department the particular materials he has counted or weighed and quantity found. Any discrepancies will be inquired into.

The result of the Stock Survey is sometimes recorded as

follows on the top of the Bin Card, leaving a permanent record.

	Stock Survey					
Date						
Result { Over . . / Short . .						
Initials						

The adjustments in the case of deficits or surplus stocks will involve—

(1) Correction of Stores Ledger balance.

(2) Debit (or credit) to Stores Adjustment Account in financial books.

(3) Credit (or debit) to Stores Account in financial books.

(4) Loss (or surplus) appearing in Monthly Expense Summary.

Such discrepancies may be caused by

(1) Waste in measuring out ;

(2) Deterioration of stock ;

(3) Wrong pricing of issue notes ;

(4) Omission or inaccuracy in recording quantities.

Where the periodical checking of Stock is not carried out, a reconciliation of the Materials Account in the financial books, with the inventory of the stores at Stock-taking time must be made, and differences due to any of the above causes may arise.

In other cases the precautions which are necessary at stocktaking are to see that all material is counted or weighed by two independent staffs, one counting or weighing and the second checking the count and not merely copying the figures on to the stock sheet ; precautions being also taken that no stock is missed and none included twice.

The stock should be valued at cost or market price, whichever is the lower, and, in the event of material having fallen in price since it was purchased, the Stores Ledger records should be written down and the amount of the loss charged to the Stock Depreciation Account.

In the case of stocks which are held on account of appreciation in their value through storage, e.g. timber, an addition to cost is sometimes made for stocktaking purposes equivalent to the interest charges on outlay represented.

Return of Material Used.

In some businesses a weekly summary of Material Issued serves as a useful guide to the Purchasing Department.

In other cases a monthly inventory of Stores is prepared and a forecast obtained of the following month's output programme and material requirements. These details then show what material *must* be hastened for delivery within the period. Minimum reserve stocks must of course be provided, and the buying policy must be based upon the anticipated requirements of a more extended period.

Stock Appropriation.

To some extent it is found desirable in practice to keep Stock Appropriation Ledgers showing to the debit material or parts on order with outside firms or in the course of manufacture in own works, and to the credit the requirements for orders actually in hand for customers or for stock. The balance on each account then shows the quantities on order in excess of prospective requirements, and is of vital importance to the Planning or Production Department. This method is useful only for cases where a minimum stock cannot be fixed and relied upon to meet manufacturing needs from time to time. For instance, a firm manufacturing machinery of numerous designs will require to ensure supplies of different sizes and varieties of many different metals, fittings and other equipment to meet not a fixed minimum of each but a supply of the actual

quantities called for by the orders coming through. It is the work of the Appropriation Ledgers to ensure that this supply will be available when called for, and the Stock Ledgers in the stores office will still show merely the actual stocks on hand. Where the method of Stock Appropriation is resorted to it is preferable to have independent Appropriation Ledgers for the purpose, rather than to endeavour to combine this work with the Stores Ledgers, which indicate the actual stock of stores. The Appropriation Ledgers will then be debited with available stock, which at stocktaking time consists of all material actually in stores and material on order; material called for by orders already in hand will be credited. Orders placed for further material are then debited to the account, and the material required for each order received, as shown by the specification which is issued to the stores for Buying Department purposes, should be credited; the Appropriation Ledger will then show material on order in excess of what is called for by the orders in hand.

Component Stores.

The General Stores which takes charge of all raw materials may be divided up into sections to suit the convenience of the different departments in the factory, but each should be under the control of the chief storekeeper, and the records should be kept in the stores office. In addition to these stores there will probably be a Tool Stores and Components or Finished Stores.

Finished Stores, whether consisting of complete machines or components ready for assembly, should be under the care of the Progress Department who will keep record of the manufacture and disposal of finished stocks.

The Progress Department will prepare stock orders for batches of standard parts, so that these can be manufactured in bulk according to the most economical manufacturing quantity of each.

The Progress Department will be supplied with copies

of orders received and will appropriate against such orders the requisite standard parts as they become available.

A minimum quantity of unappropriated parts of each type will be fixed and the stock orders for renewal will be issued as the available stock above the minimum is appropriated.

By thus controlling the manufacture of stock parts strictly in accordance with immediate requirements, the prompt execution of orders for finished machines (practically from stock) can be assured and a safeguard is established against the over-production of some parts, which is a risk attending mass production systems.

The supplies for Components Stores and Finished Stores will arise mainly from completed work on Stock Orders. When finished these articles will be delivered to the appropriate stores, and a credit note for finished work will be issued and attached to the Works Order. In a Cost Department the cost of the job will be obtained and charged to Stores. Issues will then be made as required and charged out at the Works Cost price thus obtained.

Stock Turnover.

The rate of stock turnover is indicated by a comparison of the balance of Stores Account with the monthly withdrawals of stores, indicating how many times in a year the stock is being renewed.

Material Reconciliation.

1. FINANCIAL ACCOUNTS—

Purchases Account

		£			£
Jan. 1	To Stock. .	10,000	Dec. 31	By Stock. .	15,000
Dec. 31	,, Purchases	30,000	,,	,, Material used .	25,000
		£40,000			£40,000

2. Cost Accounts—

	£	£
(*a*) Material charged to Jobs—		
(1) From Purchases Analysis . .		5,000
(2) From Stores Issues . . .		18,000
(*b*) Material chargeable to Expense Accounts—		
(1) Material used on Repairs .	1,000	
(2) Consumable Stores, Oil, etc. .	500	1,500
		24,500
(*c*) Material not accounted for . . .		500
		£25,000

Due to—

(1) Waste or pilfering.

(2) Variations from cost in pricing of requisitions.

(3) Stock depreciation; or fall in value of stock.

(4) Calculation or posting errors.

EXAMPLE XVI

From the following details of the purchase, receipt, and issue of telephone cable (Stores No. A.427), prepare Stores Record—

Jan. 1. Stock on Hand—5 miles at £25 mile.
,, 5. Purchased: T.C. Co.—2 miles at £20 mile, delivery 15th January.
,, 15. Received: T.C. Co.—1 mile.
,, 3. Issued to Contract 143—2 miles.
,, 4. Returned from Contract 143—220 yd.
,, 10. Returned to T.C. Co.—½ mile.

Adjust price at 31st January to basis of last purchase.

OR FINISHED COMPONENTS PURCHASED

PURCHASE

FINANCIAL ACCOUNTS

Order
|
Invoice
|
Purchases Book
|

Dr.	*Cr.*
Purchases Account	Supplier

Rejected Material

Returns Book
|

Dr.	*Cr.*
Supplier	Purchases Account

Net Purchases
(adjusting Stocks)
Dr.
Manufacturing Account

USE IN FACTORY

COST ACCOUNTS

Stores Requisition
|
STORES
|
Stores Issues
Summary
|

Dr.	*Cr.*
Job	Stores Issued

Rejected Material

Stores Returned Note
|

Dr.	*Cr.*
Stores Issued	Job

Net Stores Issued
Cr.
Costs Manufacturing Account

ANSWER

STORES GROUP A | NAME Cable | BIN No. 427

MAXIMUM 10 Miles | MINIMUM 5 Miles

ORDERS PLACED.					RECEIVED.				ISSUED.				BALANCE.
Date.	Order Reference.	Quantity	Delivery Specified.		Date.	Receiving Slip Reference.	Quantity.		Date	Requisition Reference.	Quantity.		Quantity.
Jan. 5	T.C. Co. .	2 miles .	Jan. 15	£20	Jan. 1	Stock .	5 miles .	£25					5 miles £25
					5	Returned C. 143	½ mile .	£25	Jan 3	C. 143 .	2 miles .	£25	3 ,, £25
													3½ , £25
					15	T.C. Co. .	1 mile .	£20					2½ ,, £25
									10	T.C. Co. .	½ mile .	£25	3½ ,, £20
					By Fall in Value on Stock, £			13 2s. 6d.					

CHAPTER X

MULTIPLE COSTS—EXPENSES

Expenses.

THE charging of expenses fairly and equitably over work produced is the most difficult part of a Cost Accountant's duties. It is impossible to determine actual expense in carrying out a given order for a customer, and the detailed application of sound principles in the distribution of total expenses is the only method that can be adopted.

When the output of a factory consists of articles of a uniform design, the amount of indirect expense attributable to each can be ascertained by dividing the total amount of expenses for a definite period, say one month, by the number of articles produced ; and if it is desired to obtain a comparison of the expenses with some other basic unit, as will be necessary if the *completed* article were only turned out at certain periods of the year—other seasons being devoted to the manufacture of parts—then the amount of wages in comparison with the expenses will be, in such a case, a reliable guide. For example, a small engineering works manufacturing a standardized cream separator can calculate the cost of each machine by dividing the total outlay over a period by the number of machines turned out ; or the ratio between the indirect expenses and the wages should be constant, provided efficient conditions are maintained.

When a business having run on these lines adds a number of other products to its output, turning out in addition to the cream separator a dozen or more other agricultural implements, the method ceases to be effective as a true indication of the share of the expense to be attributed to each article because of variations in the work required to be performed. Further, there is no ready indication in the accounts of the source of each expense by which increases can be investigated and cut off if not remunerative. It is for these reasons that cost accounts come into operation.

It must not be supposed, of course, that a low expense rate has any connection with efficient manufacture, because the expense rate is determined by the equipment provided, and therefore with expensive equipment there will be a high expense rate; but, having ascertained the expense rate that should result in a particular factory from efficient management, the aim should be to avoid exceeding such a rate.

Expenses which are associated with particular jobs, e.g. travelling expenses to and from site; royalties; must be charged directly to the job concerned.

Standing charges may be distinguished from incidental or fluctuating expenses on the ground that the latter continue in more constant ratio to output, whereas the former are not affected by output and will bear a lower proportion as output increases: it is thus from one point of view profitable to accept orders which clear incidental expenses and show a margin towards standing charges only.

Classification of Expenses.

Charges which are grouped under the heading of expense, also referred to as Works or Establishment Charges, Overhead Expenses, Oncost, or Burden are divided into

(1) WORKS EXPENSES in which are included all items that are necessarily involved in the production of the finished article ready for sale. This heading will consequently include such items as

Indirect wages including

(*a*) Foremen and their assistants;
(*b*) Shop clerks;
(*c*) Timekeepers;
(*d*) Storekeepers and stores labourers;
(*e*) Power House wages;
(*f*) Transportation wages;
(*g*) Maintenance services;
(*h*) Waiting time;
(*i*) Labourers cleaning machine tools and shops;
(*j*) Watchmen.

Rent and rates of factory; or if the premises are owned, interest on the amount of the outlay *may* replace rent.

Power, whether from coal, gas or electricity.
Heating and Lighting.
Insurances—Fire, Compensation and National.
Sundry consumable stores—oil, waste, etc.
Repairs and renewals.
Depreciation.
Salaries of works managers and works clerical staff.
Experimental and research expenditure.
Works stationery.
Welfare, ambulance, etc.
Inspection. This is an example of a charge which can often be more advantageously made a direct charge by specific bookings to individual jobs. Where this is not practicable it will be a works expense. Another charge of this type is the cost of tool-setting, which may be a direct charge if the work is specially done for each job; but if the nature of the work permits several similar jobs to be put through each time a machine is set the cost must be made a general one and charged in the Overhead Rate.

Cost of Overtime. The extra payment made to employees for working overtime often does not fall upon the work which has necessitated the late hours, and for this reason and for comparison purposes between similar jobs, the charging of overtime on one and not on another occasions undesirable disparity. To avoid this the cost of overtime may be regarded as an overhead expense chargeable to the department where the work is done, or if due to programme being in arrear, to department responsible for delay; if due to customers pressing for delivery, to the Cost Account of the job; if due to general pressure of work in excess of capacity, to general works expenses.

Waiting Time. Time of workmen while they are not actually at work should be booked as a separate expense charge. This may arise through jobs not being ready, or material not being available, or cranes being employed, etc.

If this expense is booked under a separate expense number against the department where it is incurred, the cost of waiting time can be traced and may be considerably reduced.

(2) OFFICE OR GENERAL EXPENSES. These are subdivided under Administration Expenses relating to general business management, and Selling and Distribution Expenses incurred in order to dispose of the finished goods. They are a trading and not a manufacturing charge.

Items of Administration Expense include—

General Management Salaries and Directors' Fees.
Office Salaries.
Stationery.
Postages and other expenses.
Rent, Rates and Insurance of Offices and depreciation of office furniture.

Selling and Distribution Expenses include—

Salesmen's salaries and commissions.
Advertising and printing of catalogues and price lists.
Agencies and branch office expenses.

Carriage. Carriage and cartage of raw material is part of the cost price of the material, and not an overhead expense; but, to simplify the pricing of stores, the cost of local carriage and cartage is often classed with General Works Expenses. Carriage outwards may be included with Selling Expenses or treated as a specific delivery charge on each product.

Discounts and Bad Debts. Frequently, these two items are not dealt with by means of overhead. Discount is then an addition to the cost of each order; and bad debts are treated as losses chargeable against trading profit.

Discounts or commissions receivable are a source of income usually treated as extraneous to manufacturing and trading operations, but for simplicity these are frequently deducted from administration expenses. Trade discounts should be deducted from purchase invoices.

The question of interest is dealt with later. See page 137.

The need for the division between works and office

expenses arises in the first place because the two sets of expenses are related to entirely different factors in the handling of the goods, the works expenses being incurred on each article in proportion to the effort put out in its manufacture, and the general expense being incurred on each article in proportion to the difficulty of marketing it; and in the second place the manufacturing expenses are a proper charge to include in a valuation of work-in-progress, but the selling expenses can be charged only against sales of finished goods and the general management expense is usually similarly treated.

Expenses in Financial Accounts.

As already explained in the chapters dealing with materials and wages, the Cost Office should dissect the charges under those headings, so as to be able to obtain in the financial accounts as complete an analysis as possible of the expense incurred. In order to facilitate this a series of standing orders or factory expense orders should be prepared, each standing order defining a particular class of expense and having a serial number. The workmen, in booking time and obtaining stores, will then specify the standing order number covering the expense item under which the material or wages falls, and the analysis in the Cost Office is facilitated. Thus, in respect of wages the time sheets or job cards of each man when chargeable to indirect expense will show—

(1) Shop to which he is attached and man's number.
(2) Standing order number on which he is working.
(3) The department for which the work is being done.

For example, tool room mechanics repairing tools for No. 15 department would book their time against number 15/18, when 18 represents the standing order number for tool repairs. The figure 18 without a shop number would indicate that the repairs are general and not for a specific shop. Similarly, repairs to power house plant done in 25 shop would be booked to 10/14, 10 being the Power

House Department and 14 the standing order number for repairs to plant. Similarly with material, the storekeeper will insist before issue upon the identification in this manner of the use of all material demanded. The expense standing order number then indicates the expense classification into which each item falls, and this is all that is required for accounts purposes. The shop number will be wanted at a later stage, in order to identify the charges with the shops or departments to which they should be placed.

A periodical analysis of wages earned and stores issued is compiled by the Cost Department and on this basis the Accounts Office will journalize the transfers from Wages and Stores Accounts respectively. At similar periods an expense summary should be taken out from the financial accounts which serves to focus the indirect charges and should be used—

(1) For criticism of current expenses in comparison with a standard schedule laid down in advance.

(2) For comparison month by month with previous summaries.

(3) For the purpose of securing control over the expense charges in detail by the allocation of each charge over the works departments responsible for incurring it ; a comparison being made from time to time of such departmental charges.

A useful comparison may be made week by week from the wages dissection of the ratio of direct or productive wages to total wages, but as the indirect wages do not embrace, by any means, the whole of the running expense, this comparison does not entirely cover the field.

In place of numerical standing order numbers a series of symbols is sometimes used, e.g. B. R. for Building Repairs ; P. R. for Plant Repairs, and so on.

Periodical Comparisons.

In the preparation of periodical expense summaries on these lines, the question presents itself of the period to be

adopted for the purpose. Seeing that wages are necessarily dissected in weekly periods, whereas purchases, salaries and trading results are most conveniently dealt with in monthly periods, the practice is often used of having two four-week months and a five-week month to each quarter. This has the advantage that none of the periods is sufficiently far away from the calendar month to disturb the monthly charges, but the main purpose of the expense comparison is destroyed because of the recurring five-week wages periods. The logical method appears to be to

MONTHLY EXPENSE SUMMARY—WORKS EXPENSES

	Total.			Purchases.			Stores Issues.			Wages.			Journal.		
	£	s.	d	£	s.	d.	£	s.	d.	£	s.	d	£	s.	d.
1. Foremen :															
Assistant do.															
Ratefixers															
Setters-up															
2. Storekeepers															
3. Shop Clerks :															
Timekeepers															
Progress Clerks															
4. Crane Drivers															
5. Shop Labourers :															
Yard Labourers															
Transport do.															
6. Sundry Labour :															
Waiting and Learning															
7. Inspection															
8. Indirect Material															
9. Steam and Electric Power															
10. Heating															
11. Gas and Electric Light															
12. Water															
Repairs to :															
13. Buildings															
14. Plant															
15. Transport and Rolling Stock															
16. Machinery															
17. Patterns															
18. Loose Tools and Utensils															
19. Jigs and Dies															
20. Rent and Rates															
21. Insurance :															
Fire															
Health and Unemployment															
Compensation															
22. Stationery															
23. Salaries of Works and Technical Staff															
24. Salaries of Works Clerical Staff															
25. Experimental and Research															
26. Canteen and Welfare															
27. Depreciation															
28. Stores Adjustment															

MONTHLY EXPENSE SUMMARY—GENERAL EXPENSES

	Total.			Purchases.			Salaries.			Petty Cash.			Journal.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s	d.
Office Rent and Rates															
Heating and Lighting															
Insurances															
Office Salaries															
Stationery															
Postages															
Sundry Expenses															
Depreciation															
Travellers' Salaries															
„ Commissions															
Agency Expenses															
Advertising															
Catalogues, etc.															
Discounts															
Carriage															
Bad Debts															
Bank Interest															
Directors' Fees															

adopt a four-week month all the year round with 13 periods to the year and this arrangement gives excellent results.

The above example of a monthly expense summary indicates a useful method of tabulating charges. The source of each expense in the books is indicated and serves as a check upon the figures brought into account and a useful indication of the type of the expense, e.g. in connection with repairs, the amount of purchases, stores material used, and wages incurred should be shown against each item. The fifth column will comprise special journal entries, transfers from suspense accounts and other exceptional charges.

Departmental Analysis of Works Expenses.

Assuming the total expenses of the month to be tabulated in this manner the next step is to allocate the works

expenses over the departments, because, according to the information which can be obtained of the expense of running the different departments and the actual work which necessitates the expense, the system of overhead to be used for charging up expense to the work done will have to be determined.

The nature of the work carried on will determine the division into departments. The natural division of a works into separate workshops may not be sufficient for this purpose because more than one kind of work may be carried on in each shop, and there should be a separate department for each distinct class of work or process. The following would be some of the typical departments in an engineering works—

Pattern Shop,
Foundry,
Heavy Machine Shops—which may be divided into Planing, Boring, Turning, etc.,
Light Machine Shops—similarly divided,
Tool Shop,
Erecting Shop,
Test Department,
Paint Shop.

The above would be operating departments charging up labour to the work undertaken, and the total amount of expense must ultimately be placed upon these shops and, by means of overhead rates, upon the work which they do.

In addition to these operating departments the non-productive or general service departments may include—

Power House,
Transport,
Stores,
Building Service,
Hydraulic Power Service,
Compressed Air Service,
Welfare,
Management, and others.

Allocation of Works Expenses.

In order to obtain a basis for dividing the charges in the financial accounts it will be necessary to obtain statistical data according to the incidence of each expense. A schedule setting out a natural method of division and a number of typical expenses is shown below, and in the preparation of such a schedule care must be taken that the original data are correct. The basis in the case of heating, lighting, and building service will be a more or

EXAMPLES OF SCALES FOR ALLOCATION OF WORKS EXPENSES NOT DIRECTLY BOOKED TO SPECIFIC DEPARTMENTS

Expense Service.	Basis of Allocation.	Departments: 1.	2.	3	4.	5.	6.	7.	8.	9.	10.
Steam or Electric Power	Consumption Return										
Heating	Volume of Premises										
Gas	Consumption										
Electric Light	No. of lights										
Water	Consumption										
Hydraulic Power	,,										
Compressed Air	,,										
Building Service Including Rent, Rates, Fire Insurance, Repairs, etc	Area or Capacity of Buildings										
[1]Stores Service	Total Wages in Operating Departments										
[1]Transport Service											
Office											
Management											
Welfare											
Health and Unemployment Ins.	Actual										
Compensation Ins.	,,										
Depreciation and Fire Insurance	Value of Plant										

less permanent division and a percentage of the monthly total in accordance with the fixed scale will be charged to each department. Where the basis of allocation is the

[1] *See* Note upon Warehousing Overhead Rate (p. 137).

JANUARY_____.

ALLOCATION OF EXPENSES TO OPERATING SHOPS—GENERAL SERVICES

Account.	Total per Summary.	Power.	Heating.	Gas and Water.	Hydraulic.	Building.	Stores.	Office Management and Welfare.	Transport.	Totals to Shops.
	£	£	£	£	£	£	£	£		£
Foremen	500									500
Storekeepers	150						150			
Shop Clerks	220									220
Progress Clerks	100							100		
Crane Drivers	145						15		40	90
Labourers	350					20	120	20	100	90
Sundry Labour	50				20					30
Inspection	250						50			200
Indirect Material	125						5	5		115
Power	320	320								
		− 80			+ 30			+ 30	+ 20	
Heating	120		120							
			− 30				+ 15	+ 15		
Gas	55			55						
				− 20				+ 20		
Water	20			5	15					
Repairs	750	100	50		10	75	20	10	20	465
Rent and Rates	400					400				
		+ 20				− 100	+ 30	+ 50		
Carriage	220								220	
Fire Insurance	110					110				
National Health & Unemployment Insce.	150	3			1		10	20	15	101
Compensation	80	1					3	6	5	65
Works Salaries	400							400		
„ Clerical	120							120		
Stationery	100							80		20
Experimental	20							20		
Canteen and Welfare	100							100		
Depreciation	800	20	5		5		10	10	20	730
Stores Adjustment	20						20			
	£5,675	£384	£145	£40	£81	£505	£448	£1,006	£440	£2,628

It will be understood that considerable detail has been omitted.

actual consumption, the records (or estimates if no actual records are available) should be obtained at frequent intervals. Where the allocation is based upon wages, the actual wages of the period in question must be used; and in connection with depreciation the machinery and plant schedules for each department should be frequently revised. There will often be special circumstances modifying a strict adherence to general rules, which are, of necessity, only an approximation to the true position, e.g. in the case of stores service, a department having a departmental store of its own and carrying the whole of that expense might fairly be relieved of part of its share of the general stores service. Similarly, the cost of works management salaries may not be a fair charge on all departments on a wages basis, as when one department requires skilled technical advisers and another is of a different nature and can be run with slight supervision, an adjustment of the wages scale may fairly be called for.

When the basic scales have been prepared the first step is to separate those departments which may be termed General Services as distinct from Operating Shops, and extract the allocation of expenses to be made to them.

This will entail not only the merging of some of the expense items entirely in the General Services, but the adjustment of the charges to be made by one General Service to another, each department having still to be regarded as bearing a fair share of each expense in which it benefits, and various charges accrue to the General Services in addition to the direct payments shown in the financial accounts, e.g. Stores Department will be charged with not only the storekeepers' wages, but with a share of the rent and rates, etc. (coming under the head of Building Service along with Building Repairs, Fire Insurance, watchmen, and other allied expenses), also with Light and Heat, Repairs, and any other charge incurred for it by another department.

The Expense Charges will thus be grouped as directly

JANUARY_____.

ALLOCATION OF EXPENSES TO OPERATING SHOPS

Service.	Total.	Dept. 1.	Dept. 2.	Dept. 3.	Dept. 4.	Dept. 5.	Dept. 6.	Dept. 7.	Dept. 8.	Dept. 9.
	£	£	£	£	£	£	£	£	£	£
Foremen	500	25	80	25	80	25	30	25	80	80
Shop Clerks	220	10	35	10	35	10	35	10	35	40
Crane Drivers	90		30		30					30
Labourers	90	10	10	10	10	10	10	10	10	10
Sundry Labour	30	5	20		5					
Inspection	200			100			100			
Indirect Material	115	5	25	5	25	5	25	5	10	10
Repairs	465	20	140	10	50	90	120	20	10	5
National Health & Unemployment Insce.	101	5	16	5	16	5	16	5	15	18
Compensation	65	3	12	3	12	3	12	3	9	8
Stationery	20						20			
Depreciation	730	30	200	20	70	130	180	10	15	75
Power	384	15	100	10	35	65	90	5	7	57
Heating	145	6	20	6	20	6	20	6	20	41
Gas and Water	40	5	5	5	5	3	2	3	2	10
Hydraulic	81		81							
Building	505	25	80	25	80	25	80	25	80	85
Stores	448	20	70	18	55	25	80	15	30	135
Management	1,006	50	170	40	130	60	200	30	70	256
Transport	440	20	70	18	55	25	80	15	30	127
Overhead on other Shops' Repairs			+ 30	- 70		+ 15	+ 25			
	£5,675	£254	£1,194	£240	£713	£502	£1,175	£187	£423	£987
Direct Wages	£3,000	£150	£500	£120	£400	£160	£600	£100	£200	£770
Wage Hours	33,900	2,000	6,000	1,000	3,500	1,500	7,000	900	2,000	10,000

chargeable to specific shops or chargeable to certain General Services which are to be allocated according to the scales already drawn up.

The next step, after arriving at the amount of the General Services charges, is to distribute these as shown on the second schedule over the operating shops, along with the directly booked expenses as indicated by the shop numbers affixed to the standing order numbers on the time sheets and material requisitions which have come from the shops. By this means each of the operating departments is burdened with a fair share of the whole of the factory running expense.

Tool Department.

In the Tool Department of an engineering works Direct Labour and Material are used upon the manufacture of tools entirely for certain jobs ; to that extent the expenditure, along with appropriate overhead, is a specific charge to the jobs. Other tools will be Department Expenses and so require to be included in the Tools Expenses charged to other shops. The Tool Department will thus show the following position—

TOOL DEPT. NO. 3

Dr.		*Cr.*			
To Direct Wages	£120	By Production Orders—			
„ Direct Material	510	Tools for Specific Jobs			£860
„ Wages—Other Shops Repairs	35	„ Shops Tools Repairs—			
„ Material—do.	315	No 2 Shop—			
„ Expense Allocation	310	Wages	£15		
		Materials	125		
		Expense	30		
				170	
		No. 5 Shop		105	
		No. 6 Shop		145	
	£1,280			£1,280	

The Direct Wages and Materials represent outlay on Production Orders for specific jobs ; the Expense Allocation is the amount of Tool Department running charges. The tools made for specific orders must be costed at Direct Material, plus wages, plus overhead, and charged to the respective jobs. The work done for the other shops will be costed on the same lines. In the Schedule, page 124,

this is illustrated in the adjustment on the last line of the allocation, where the Tool Department No. 3 credited with £70 and other departments are respectively debited in respect of the overhead on the Repairs executed by the Tool Shop for the other three shops. In this table the " Other Shops Repairs " are shown in the columns of the department for which the repairs were executed. The overhead charged to departments 2, 5, and 6 is therefore an addition to the amount of repairs in these three departments, and the amount of £70 is a deduction from the various running expenses incurred in Department 3. This leaves a balance in Department 3 of running expenses to be charged upon the Production Orders ; so that as the wages of these Production Orders have totalled £120, there is an overhead rate of 200 per cent applicable. In arriving at this overhead rate, the wages on Production Orders plus the wages of Other Shops Repairs Orders must be added together and divided into the total Expense Allocation.

The treatment of the expenses in tabular form saves the necessity for writing up book-keeping accounts for each shop and serves exactly the same purpose.

It will be found that the departmental plan may be applied in fixing an overhead rate for workmen engaged upon outside repair work or erection of plant. A low rate of overhead will be applicable; for internal works expenses will not fall on to their operations at all but only such items as supervision, works office, works management.

At the foot of the distribution schedule is shown the amount of direct wages in each department for the same period and the number of hours comprised in these wages.

Departmental Overhead Allocation in the Financial Accounts

This allocation of works expenses to the departments may be carried into a special section of the Nominal Ledger by crediting Factory Expense Allocation Account and debiting Department Accounts for each shop in respect

of the allocations made. The model on page 124 is a useful form of ledger account to adopt for this purpose.

The amount of overhead chargeable to Work-in-Progress Account will then be credited to such Department Accounts. This will have the effect of showing the position of each departmental overhead rate in the financial accounts.

An alternative plan, which has many advantages, is to maintain in the financial accounts the arrangement of expenses shown in the periodical expense summary, so that at the end of the year the total expense under each head is obtained. The dissection, month by month, of these expenses over the departments is recorded as a statistical matter in the Cost Office by means of expense schedules similar to those reproduced, and at the end of the year the total amount of expense on each department is obtained. The grand total of this will, of course, agree with the grand total of the expenses shown in the expense summaries, and by this means the same result is obtained as will be produced if the monthly allocation to departments were journalized but without quite so much complication.

Charging Works Expenses to Jobs.

The problem that presents itself now is to determine the best method of ascertaining the proportion of works expenses chargeable to each job, so that the charges shall bear a close relation to the cost of the work performed in each case. The following methods must be examined—

OVERHEAD METHODS—

Flat Rate as Percentage of Direct Wages.
,, ,, per hour of Direct Wages.
Separate Rates for Machine } Labour.
,, ,, ,, Fitting }
,, ,, ,, Hand }
Warehousing Rate on Material.
Departmental Rates per hour of Direct Wages.
,, ,, as Percentage of Direct Wages.

EXAMPLES OF COST

CONTRASTING METHODS OF CHARGING EXPENSES

TOTAL WEEK'S WAGE . . £500.	"A SHOP . £120.	"B" SHOP . £250.	"C" SHOP . £130.
,, HOURS . . 5,500.	,, . 1,700.	,, . 2,000.	,, . 1,800.
,, EXPENSE . £1,200.	,, . £500.	,, . £500.	,, . £200.
	SHOP "A"	SHOP "B"	SHOP "C"
TOTAL EXPENSE EQUALS 240% or 52·4d. Hr.	416 6% or 70·6d. hr.	200% or 60d. hr.	153·9% or 26d. hr.

	TOTAL.		TOTAL EXPENSE.		SHOP "A."				SHOP "B."				SHOP "C."				TOTAL EXPENSE AT DEPARTMENTAL RATES.	
	Wage.	Hours.	240 %	Hour Rate.	Wage.	Hours.	416·6 %	H/R. 70·6d.	Wage.	Hours	200 %	H/R. 60d.	Wage.	Hours.	153 9 %	H/R. 26d.	%	H/R.
ORDER 1 .	£50	470	£120	£102 12 4	£40	370	£167	£109	£10	100	£20	£25					£187	£134
ORDER 2 .	£30	350	£72	£76 8 4					£10	100	£20	£25	£20	250	£31	£28	£51	£53
ORDER 3 .	£70	830	£168	£181 4 4					£50	600	£100	£150	£20	230	£31	£26	£131	£176

Machine Rates per hour of Direct Wages
Machine Rates as % of Direct Wages
} Combining General Rate.

Machine Rate per hour of Machine Time in conjunction with a General Works Rate on Direct Wages.

RATES OF OVERHEAD—

It will be observed that the model (p. 122) gives an average rate of—

190%
or 3s. 4d. per hour } on Direct Wages

and Department Rates ranging between—

315%
and 128%
or 6s. 8d. per hour
and 2s. per hour } on Departmental Direct Wages.

(1) *Percentage on Wages.* One very general method of charging factory expenses is by a percentage on the amount of direct wages charged to each job. This has the advantage of simplicity, but in most cases it is entirely unsound because—

(*a*) No adjustment is made for the equipment used by different workpeople, as, for example, where in one department a mechanic is using an expensive tool to shape a heavy casting and in another department hand labour is employed on light work.

In view of the fact that in an engineering works, for example, different types of machinery will incur different amounts of expense in the various departments in the course of manufacture, it becomes important to know upon which machines the greatest expense is being incurred. Where a flat rate is used any two machines upon which a given number of hours or a given amount of wages has been expended, will be charged with the same amount of Overhead or Works Expenses, whether the work has been done

mainly in an expensive department or in one in which there is very little machinery and equipment.

(*b*) Even if the whole of the operations were of the same type, the expense would not necessarily vary according to the wages paid, because the wages of one employee and another naturally vary for the same amount of work, so that a flat rate of expense as a percentage of direct wages can be correct only if the work is entirely standard and the wages at uniform rates. Where this is the case the under-charge of expense in the heavy shops is balanced by the overcharge in the light shops as the work goes through. As it very rarely happens that the same proportion of time is spent in each department on every product, so the resulting overhead is bound to be incorrect in the majority of cases. The amount of inaccuracy in the costs may indeed be sufficiently substantial to more than counter-balance the amount of profit obtainable on some of the articles manufactured, and, in effect, although a flat rate of overhead may be showing an apparently satisfactory profit on all goods, the correct adjustment of the overhead would show that without certain particular lines the trading result as a whole would be considerably improved.

(2) *Direct Labour Hour Method.* It is consequently preferable to obtain the number of hours of direct labour on each job by totalling the time recorded on the time sheets in making up the wages abstracts, and, by dividing the total direct labour hours into the factory expenses, a charge on an hourly basis is obtained and Works Expenses at this rate can be placed to each cost account for the number of hours worked by the men on it. This is more correct than a percentage of wages, because the factory expense corresponds more closely with the number of hours worked than with the amount of wages paid, and the irregularity of overhead caused by unequal rates of pay is eliminated; but a flat rate on this principle still takes no account of the equipment used. The result of the flat expense rate, whether as a percentage or a rate per hour, is to overcharge

the jobs which are done by hand labour or with light machinery and to undercharge those on which heavy machines are used.

(3) *Rates on Classes of Labour.* A simple plan to avoid this result to some extent is to fix (*a*) a general rate for hand labour based on works expenses without considering expenses attributable to machines, (*b*) a higher rate for fitting shops allowing for the cost of tools, etc., and (*c*) a heavier rate for machine shops. Where there is no great diversity in the types of machines this plan is satisfactory, and it may be applied in the form of percentages on wages, or rates per hour ; the percentages plan being an approximation from the rate per hour to endeavour to obtain the same result without the elaboration required to record the hours worked.

In extensive works a more elaborate plan is necessary. An engineering works may be equipped with heavy machine tools, requiring considerable space to operate, repairs, power, and other running expenses in proportion ; as well as other shops where the work may be entirely hand labour engaged upon light metal articles ; and with many grades of machine shops between these two extremes.

An example may be quoted, giving illustration of total cost where different classes of labour are employed on the same work.

	Rate per Hour.	Time per Piece.	Wage Cost.	Expense at 200%.	Total Cost.	Expense . 5s. hr.	Total Cost.
	s. d.		*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d*
Skilled . .	2 –	2 hrs.	4 –	8 –	12 –	10 –	14 –
Semi-skilled .	1 4	2½ ,,	3 8	7 4	11 –	13 9	17 5
Learner .	8	5 ,,	3 4	6 8	10 –	25 –	28 4

The items shown in the comparison (p. 128) are representative orders, and under each method the total expense charged comes to approximately the same amount ; but owing to the different systems of apportionment, serious differences arise.

Order No. 1 shows an expense charge of £120 on the

General Percentage basis; on the General Hour basis, £102 12s. 4d.; corrected on the Departmental basis to £134.

Order No. 2, on the General Expense basis, has an expense cost of £72–£76; corrected on the Departmental basis to £51–£53.

Order No. 3 has a reduced cost also on the Departmental plan—£176 on the hour method against £181.

Departmental Rates.

It is frequently found sufficiently accurate for practical purposes to group the operations of a factory into departments, each department comprising a group of similar machines, or a single machine, or a set of operations. For each such department a separate overhead rate must be fixed, either as a rate per hour of operation of the different machines, or a percentage upon the wages incurred. For the sake of simplicity in the Cost Accounts the percentage method is frequently adopted, but this has the disadvantage that the overhead charge will fluctuate with the rate of wages paid, whereas it should be affected only by the number of hours worked; e.g. in the case of two men operating similar machines, one earning a high rate of bonus as a piece worker, and the other not being so skilful, the amount of overhead charged in respect of the two machines should be the same for the hours worked, but in the case of the piece worker earning a heavy bonus if the percentage rate is used a heavier overhead charge will be obtained.

A "Department" for this purpose will consist of a shop where a specific process or variety of work is carried on; or a group of similar machines—forming part of a machine shop containing several such "departments." The essential plan is that each separate kind of work must form a department to itself. The works expenses are then allocated to the departments, and a rate is fixed for each department based on the direct or productive wages paid in it, either as a percentage or a rate per hour. Within each department an average rate of working is obtained so that

approximately normal results of working are constantly secured.

The features of the departmental oncost system are—

(1) Department rates of overhead.

(2) Allocation of Works Expense to the departments—either monthly or yearly.

(3) Comparison of Department Expenses with overhead recovered and consequent revision of oncost rates.

It is advisable that a monthly allocation should be made of the works charges so that the expense being incurred by each department can be ascertained and controlled. A schedule or budget should be prepared in advance; and comparisons should be made against this standard as well as against the amount of overhead chargeable on the work done in the shop. Alterations of overhead rates should be made only at longer intervals—sometimes yearly—to obtain permanence wherever possible and to avoid changes in estimating for contracts.

Machine Rates.

A further development in the accurate recording of working cost is to endeavour to ascertain the expense of running each machine, in order to be able to charge the work done on the machines with the actual expense due to such work being performed. The first step is to ascertain the correct departmental rates and these must be subdivided in turn. Instead of treating each machine separately, which might result in an excessive number of almost similar rates, it is usually preferable to treat them in groups and fix a rate for each group. The machine rate may be arranged to include the whole of the works expense upon the basis of the number of hours the machine will work, or it may be arranged in conjunction with a general works rate which provides for the general expense of the factory, and the machine rate will then cover only the expense directly associated with the machine. The latter method has the advantage, perhaps, of obtaining the

closest degree of approximation that can be expected to the actual expenses incurred on each job, but this plan, while apparently sound, has the following weak points—

(*a*) It is impracticable to allocate with accuracy the works expenses over all the machines separately, on account of the irregularity in running time.

(*b*) Even if the above allocation is attempted it is impossible to estimate the time that each machine will run during any future period.

(*c*) In consequence no correspondence between expense of running and overhead earned by each machine can be maintained.

(*d*) From the point of view of application in practice the use of a multiplicity of rates leads to inaccuracy in costing.

The particular items of shop expenses which are covered by—

(*a*) Productive hour rate applicable to all wages,

(*b*) Machine hour rate applicable only to machine time, may vary in different cases, but the general principle to be worked upon is to include in the machine rate all those expenses which are necessarily associated with the provision of the machines and to base upon the productive hour rate all those general charges which would remain if the machines were discarded.

Unless these charges are very carefully handled, and the detail work in connection with the compilation of the overhead records is accurately carried out, the results are apt to be more inaccurate than is likely to arise with departmental systems. This is a serious drawback in practice and on this account the method has been frequently found unsatisfactory.

For the fixing of machine rates more detailed analysis of the works expenses is required, in fact, each department must be split up so as to obtain an allocation of its expenses over the machines, treating each machine in all respects as the departments were treated in dividing up the total works expenses. In this way individual expense charges

are obtained for each machine and, allowing for the average running hours, an hourly rate can be fixed.

The items needed are—

(1) Building Service Expense for space occupied with cost of heating and lighting.

(2) Power.

(3) Repairs and sundry supplies including tools, oil, etc.

(4) Charge for Capital Outlay consisting of depreciation and interest on outlay.

In determining the first, regard must be had to the space occupied by the machine and its surroundings.

The second and third will be ascertained from the records of power, etc , consumed and the requirements and running hours of machines in the shop.

The fourth will be arrived at in detail in every case in accordance with amount to be written off the particular

EXAMPLE OF MACHINE RATE

COMPARISON OF COST OF PRODUCTION ON TWO MACHINES

	MACHINE "A"	Cost per annum.	MACHINE "B."	Cost per annum.
Rental Cost	Floor space occupied say 400 ft. at 1s.	£20	say 800 ft. at 1s.	£15
Power	50 weeks of 48 hours, less 15% idle time, estimate	£200	Estimate	£50
Repairs	Estimated to average	£50	Estimate	£10
Capital Outlay	Cost, £1,000 5% Interest 18% Depreciation to reduce value to £100 in 5 years	£50 £180	Cost, £500 6% Depreciation to reduce value to £200 in 10 years	£25 £30
Works Rate	1s. per hour	£102	1s per hour	£102
	Cost per annum	£602	Cost per annum	£232
	Cost per running hour (2,040 hrs. per annum) or Wage cost per hour, say	£·295 70·7d. 37· d.	Cost per running hr. or Wage cost per hour	£·113 27·17d. 24· d.
		107·7d.		51·17d.
Capacity, or Output in units of standard work		30 units	Output	10 units
Cost per unit		3·59d.	Cost per unit	5 117d.

machine, and may be varied from time to time, especially if additions are made.

General Works Rate may be included in the machine rate, or it may be necessary to divide this charge between machine labour and hand labour when both are at work in the same shop.

From this it will be seen that Machine " A " will produce more cheaply than Machine " B," assuming that it can be kept occupied so as to attain the benefit from its extra capacity.

In a shop having already a shop rate, where it is desired to fix a rate specially for one machine or group of machines, a plan readily adopted is to eliminate the items (2), (3) and (4) above from the shop rate, and add the exact amounts applicable to the machines in each case.

In some works it is preferred to use the machine rate for machine charges only, in addition to a general works rate applicable to all direct labour on a percentage basis ; and the application of the example given (A) would then be a machine rate of 4s. 6d. per hour for the number of hours of the machine time, which would be separately recorded on the job notes of the men working it, together with an overhead rate on direct wages of say 50 per cent.

In the event of a departmental plan being adopted the amount of overhead in each department will be obtained from the direct wages each week as soon as the wages analysis is complete, and this amount compared month by month with the allocation of expenses will indicate whether each department is meeting its share of the burden.

The value of the Departmental Expense Allocation method still remains in a machine rate system, because the department overhead (whether wholly on wages or hours, or partly on wages and partly on machine time) in each department will show whether the rates are adequate or if any department is failing to earn the charges upon it.

It may be an advantage to fix a series of machine hour rates on a sliding scale for varying efficiencies, i.e. according to the varying number of hours it is anticipated the production centres may be running.

This scale will be of assistance to the Estimating Department to enable them to secure large orders which may otherwise be lost if a machine hour rate is used based upon a less number of hours "likely working" than the securing of the order would warrant.

Warehousing Overhead.

A difficult point arises in the correct allocation of charges incidental to the buying of material, handling and transportation of same to the operating departments. All these charges may be dealt with under the heading of Stores and Transport Services, and the plan sometimes adopted is to allocate stores service charges to the jobs on the basis of material used. It cannot be said, however, that the expense incurred on different materials will vary directly with their value or their weight, and on this account the plan is frequently preferred of merging the stores charges in the general works overhead. Approximately, however, the correct stores service charges can be obtained as a percentage on the value or rate per cwt. of materials, if the materials are grouped in a series of classes, and a separate warehousing rate fixed for each class. It then becomes important to observe that the amount of warehousing rate charged to the jobs on this basis will suffice to cover the stores expenses referred to.

Interest.

There are many divergent views among cost accountants as to the method of treating interest in obtaining correct costs of production. It is argued that interest is profit and should be disregarded entirely in arriving at the costs ; and in businesses where there is little expensive plant, and departmental rates or machine rates are not required,

this may be the simplest course to take ; and this practice is usual and has the advantage of bringing out the costs upon a basis clear of standing interest and dividend charges which from a costing point of view are closely allied. At the same time a sound objection can be urged in cases

SCHEME FOR CALCULATION OF INTEREST FOR DEPARTMENTAL ALLOCATION

Buildings.	Total.	Amount attributable to each Department, or Percentage of Total Area used by each Department.				
		Shop A.	Shop B.	Shop C.	Shop D.	Office.
Value of Outlay .	£	£	£	£	£	£
Interest at Market Rate, per cent	£	£	£	£	£	£
Plant & Machinery		Value of equipment in each department.				
Value of Outlay .	£	£	£	£	£	£
Interest at Market Rate, per cent	£	£	£	£	£	£
Total Interest on Buildings and Plant for including in Works Expenses .	£	£	£	£	£	£
Ditto—Office Expenses . .	£	£	£	£	£	£

DISTRIBUTION OF INTEREST IN RESPECT OF STOCKS ON HAND AND ON CONSIGNMENT AND OUTSTANDING BOOK DEBTS.

Accounts.	Total.	Value in respect of each line of Products or other Classification of Goods Handled.				
		1.	2	3.	4	5.
Stocks on Hand	£	£	£	£	£	£
Stocks on Consignment . .	£	£	£	£	£	£
Book Debts .	£	£	£	£	£	£
	£	£	£	£	£	£
Less proportionate deduction for Trade Creditors outstanding .	£	£	£	£	£	£
	£	£	£	£	£	£
Interest at Market Rate for inclusion in Office Expenses, say .....per cent .	£	£	£	£		£

where machine rating is used, because the comparative cost of operating two machines is not correctly obtained unless the cost of the capital locked up in each is taken into account. In concerns where large sums are laid out in equipment, and especially where the results of operation of different plants in the factories are to be compared, it is obvious that the cost of providing the equipment should be taken into account in making the comparisons and fixing the differential rates. From this point of view it must be borne in mind that the accountant is concerned with interest on money laid out, charged at a fair market rate upon the amount of the permanent outlay in the shops and departments, and it is immaterial whether the business has to provide interest on debentures, mortgages, loans, or in any other form whatever.

Where it is found desirable to take this circumstance into account, as particularly arises in the case of a company operating a number of factories, the charges may usefully be arranged under two heads—

(1) RENT—covering an equitable charge for the use of buildings which are owned.

(2) INTEREST ON PLANT—covering a market rate of interest on outlay which will be allocated over departments and machines.

The amounts to be charged under these heads should be included in the monthly expense summary and will form a credit to Interest Account against Standing Interest Charges.

An alternative method is the proportionate reduction of all rates equal to the amount of the interest included in fixing them.

In this connection it should, however, be noted that for the purpose of valuation of work-in-progress the interest included in the overhead rates cannot fairly be capitalized and must therefore be written back by making a reserve for the estimated amount.

The same procedure will naturally be required where the

FACTORY EXPENSE ALLOCATION ACCOUNT

	Jan.	Feb.	Mar.	Apr.	etc.
To Foremen	500				
„ Storekeepers	150				
etc.	. . .				
„ Inspection	250				
„ Indirect Material	125				
„ Power	320				
„ Heating	120				
„ Gas	55				
„ Water	20				
„ Repairs	750				
„ Rent and Rates	400				
etc.	. . .				
	£5,675				
By Shop No. 1 Exp. Allocation..	254				
„ „ „ 2 „	1,194				
„ „ „ 3 „	240				
„ „ „ 4 „	713				
„ „ „ 5 „	502				
etc.	. . .				
	£5,675				

A Monthly Standard may be fixed for each expense item and each shop, and shown in a separate column of this schedule.

works expenses in any period have amounted to less than the total of overhead charged to the Cost Accounts.

PATTERNS, TOOLS, etc., are dealt with in Chapter XI, page 160.

Works Expenses should be charged on (1) Sales Orders and Sales Repair Orders ; (2) Stock Orders for parts, etc., for stores ; (3) Plant extensions and Capital Expenditure (except when small in amount) ; but not on Works Repair Orders, Tools, or similar jobs which are themselves expenses. (Except as explained on page 159.)

An example of a statistical Department Expense Account would appear as shown on page 141.

The balance of this account arises either through—

(1) The shop expenses having exceeded the estimated amount or

(2) Idle time reducing the number of operating hours.

In the first case it may be necessary to increase the rates ; in the second case regard must be had to the probability of improvement.

The overhead balances resulting when making up final

No. 9. SHOP EXPENSE ACCOUNT

		£			£
Jan. 31	To Total Sundry Expenses, chargeable to Shop, including General Works Rate	987	Jan. 31	By Machine Hours (say)— 2,200 @ 5/- £550 400 @ 7/- 140 300 @ 10/- 150	840
				„ Shop Rate on Hand Labour, say, 380 Hours @ 3/- . .	57
				„ Balance equal to 6d. per hour chargeable on 3,280 Wage Hours or transferable to Overhead Adjustment Account . .	90
		£987			£987

accounts for an annual Balance Sheet should be transferred to the Manufacturing Account, as they reveal a profit or loss as the case may be. If an overhead reserve is desired a *credit* balance may be carried forward for this purpose.

Idle Time.

The cost of idle time will thus be represented by the unrecovered overhead, e.g. a department having 200 idle hours with an overhead rate of 2s. an hour will incur idle time expense of £20; small savings in respect of power, etc., will reduce this to some extent.

During periods of depression, expenses of idle departments and unabsorbed expenses of departments through low output should be charged against trading, being distinguished from manufacturing costs.

MACHINE RATE

Particulars of Machine
Location
Cost
Additional Outlay

Estimated Life

Depreciation Rate

WEEKLY RUNNING EXPENSES

Date ascertained.	Power.	Repairs.	Oil.	Depreciation and Interest.	Rental Charge.	Total Machine Cost.	Average Hours Worked.	Rate per Hour.	Wage Cost.

In addition to revealing the amount of the shop charges not absorbed by the machines, the totals of machine time also serve for the record of idle machine time, whether caused by slackness of trade or machines being out of repair.

The Idle Time record is necessary in judging the cost of one machine or method against another and may be usefully compiled as a percentage on the total running hours.

The record below may be entered weekly; time

MACHINE TIME

No of each Machine and Current rate.	1 5/-	2 3/-	3 2/6	4 10/-	5
Week Ending					
Hours at Work .					
Hours at Rest .					
Week Ending					
Hours at Work .					
Hours at Rest .					

IDLE TIME REPORTS.—The record of idle machine time should state the specific reason why the machines are not at work. This information can then be used by the progress office with a view to obtaining a division of work so as to relieve congestion in another part of the factory.

worked should be entered in black, and time at rest in red, so that the total for any particular machine over a period can be readily ascertained; also the relation of idle time to time worked can be seen at once, and the amount of

possible income represented by the idle time charged up at the correct rate for each machine is obtained.

In certain cases an exceptional treatment of machine records may be required in order not to load particular work excessively. A machine may be in use only a fraction of working hours but may be essential in order to carry out other important contracts ; the cost of the machine is thus incurred for the benefit of the plant as a whole and the general rate must bear part of its cost. In effect a rate will be fixed for such a machine on the basis of what it would cost if run a fair proportion of its time, and the fact that the machine is not actually earning its charge at this rate will be made up by a change on the general works rate.

Where a " standby " machine is required in order to ensure continuous production if the working machine should fail, the costs of both machines must be included in the machine rate of the working machine so that the whole expense will be absorbed in the number of hours working.

An exception may arise to the charging of expenses to work performed, where trade runs in busy and slack seasons. Here it would not be practicable to charge the whole of the current expense at the slack time. An average rate must be fixed which will be sufficient if spread over the whole year ; and in the busy season care must be taken that the expense for the whole year is then actually made good.

Defective Charges.

The cost of making good defective work or the loss arising in consequence deserves special attention, and in some businesses forms a very important factor in the manufacturing results. Defective charges are therefore to be subdivided under suitable headings :

(1) Defects in material which may again be subdivided in suitable cases.

(2) Defects of workmanship—subdivided if necessary.

(3) Defects in design.

Under these headings the expense charges arising through the ordinary channels of material, wages and overhead should be grouped, the charges under each works order number being made up separately so that a statistical record can be obtained of the defective charges on each job. It is preferable, however, that the defective charges should not be placed to the Cost Accounts of the job direct, as otherwise a fair comparison of the cost of different jobs is prevented and the actual record of defective work is hidden in the general details.

Maintenance and Guarantee Charges.

A similar method should be adopted in dealing with maintenance and guarantee charges, where the machines are supplied on guarantee for a specified period and have to be maintained in running order. The charges under these headings should come against the manufacturing results and may be provided for by a reserved amount against the Cost Account of each order, such items being credited to a Suspense Account. The direct charge to each job is preferable to a debit in Works Charges or Overhead Account.

Another point arises when certain lines have to be quoted in competition with other works more favourably situated. It may be justifiable in such cases to debit this work with lower rates than those generally in force and to regard part of the expense as falling on the works as a whole, or chargeable against the General Profit and Loss Account. It is obvious that there is a limit to the extent to which this method could be adopted.

Cost of Heating Furnaces.

In the metal trades the cost of heating furnaces in certain departments forms a very high proportion of the departmental expenses. Different weights and sizes of ingots, tools, etc., will require to be heated for different periods to reach the requisite temperature, and the weight may not

be in proportion to the time required for heating. Consequently the weight basis cannot be used, and the cost of heating the furnace per hour must be ascertained and charged to the ingots according to the number of hours in use. In the case of standard work charges can be fixed for different weights.

Bakery Oven Hours.

In the bakery and confectionery trades a similar principle for the purpose of charging different batches of articles for the use of ovens must also be adopted. If the ovens vary in size the capacity of each must be expressed in terms of a standard oven. The cost of operating, heating, and maintaining the oven per hour must be arrived at for each temperature required. This is expressed as a cost per oven-hour. The cost of using a particular oven at a particular temperature can be expressed at a rate per hour by multiplying the cost per oven hour by the factor relating to the capacity of the oven. Costing will be based upon the recipes used, with allowances for evaporation of moisture and for waste owing to defective baking, breakage in packing, etc. It will be necessary to keep adequate stores records and to check the output with the estimated output, so as to keep a check on waste. The charges to various batches for use of ovens must be set off against the expenses incurred in maintaining and heating the ovens. The other works expenses of an indirect nature will be dealt with as an overhead based on a charge by weight; and by departmental rates according to the amount of expense in connection with the different classes of goods.

General or Office Expenses.

Where the products are similar to the extent of being disposed of in the same market, and by means of the same selling organization, a percentage on works cost may be used to cover all charges of administration and distribution and allocations may be made to Works Expenses in respect of Factory Management.

In other cases, in the computation of Administrative Expenses some exceptions arise. It is not equitable to apportion these by a similar addition to the Works Cost in every case. For instance, one department in a works uses expensive material, e.g. platinum; another department is producing goods on which heavy advertising expense is undertaken; another concentrates upon a product selling in proportionately large quantities, with a minimum selling expense, at a cut figure.

In these cases the output must be analysed and the expenses classified on a fair basis—much necessarily resting on intelligent judgment—and rates for Administrative Overhead must be fixed for each class of product separately.

ALLOCATION OF OFFICE AND SELLING EXPENSES OVER VARIOUS CLASSES OF FINISHED GOODS

Administration Expenses—	
Office Salaries and General Office Expenses: Rent, Rates, Postages, Stationery, etc.	Proportionate to Turnover, and may be charged by an Overhead Rate on Works Cost, with adjustment in the case of goods sold in bulk lots.
Management Salaries	Ditto.
Directors Fees	,,
Selling and Distribution Expenses—	
Travellers' Salaries and Commissions	Proportionate to Sales effected individually of each class of goods.
Carriage	Proportionate to actual charges on each class of goods.
Discounts	Proportionate to terms of settlement in each class.
Bad Debts	Actual analysis of Bad Debts over each class of goods.
Advertising, Catalogues, etc.	Actual outlay on each class of goods.
Branch Expenses	Proportionate to Turnover or actual sales of goods in each class.
Bank Interest	Values of Stocks held and Book Debts in each class.

The aim in such cases is to look at each section and try to ascertain what its position as regards expense would be if it were a business by itself; in other words, what expense a competitor in each line would have to carry.

It may be necessary to use a flat rate on works cost for office expenses and a further selling overhead at differential rates for different products.

In other businesses the actual commissions, discount, and carriage on each contract can be charged up to its cost account.

Expenses and losses which are incidental to the holding of stocks should be distinguished from the expense of (1) buying, and (2) selling the goods. Warehousing expense will be proportionately reduced with increased rapidity of turnover.

In calculating costs of merchanted goods the principles applicable to general administration and selling expenses must be observed.

Works Expense Reconciliation.

1. FINANCIAL BOOKS.

Expenses per Manufacturing or Profit and Loss Account. Works Expense items—

	£
To Rent and Rates	500
,, Electricity for Power and Light	130
,, Indirect Wages for Foreman, Storekeeping, and Transport	875
,, Repairs to Plant, Tools, etc.	430
,, Sundry Works Expense	120
,, Management Salaries	245
,, Depreciation of Plant	210
	£2,510

2. Cost Accounts.

(*a*) Works Expenses analysed to Departments, say Department A, £750; Department B, £300; Department C, £1,460.

(*b*) Works Overhead on normal wages, say—

Department A—Direct Wages,	£1,500	50%	= £ 750
,, B— ,,	£400	75%	= £ 300
,, C— ,,	£1,168	125%	= £1,460

(*c*) Overhead charges to jobs—

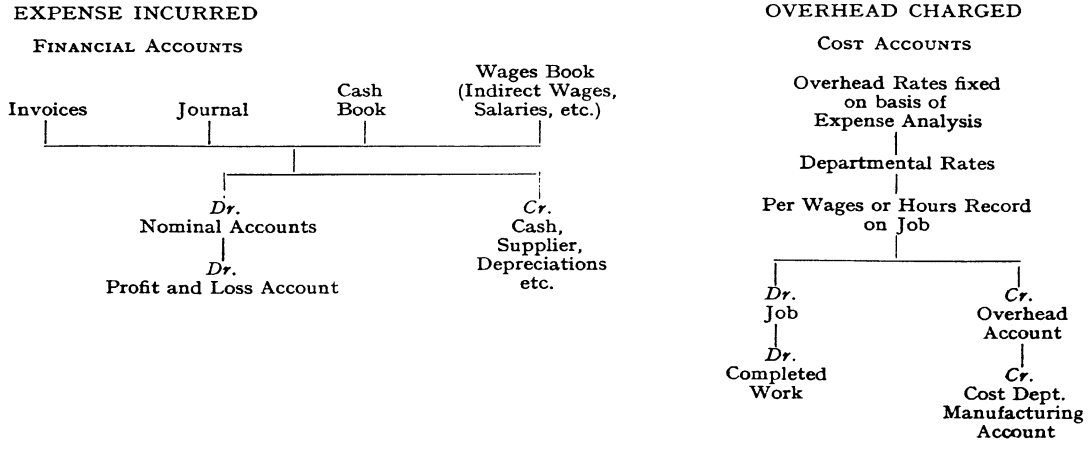
	Dept. A	*Dept. B*	*Dept. C*
Job No. 1 . . .	15	52	5
Job No. 2 . . .	24	14	27
Job No. 3 . . .	7	10	64
Various	674	204	1,374
	£720	£280	£1,470
	£	£	£
Unabsorbed . . .	30	20	
Overcharged . . .			– 10
	£750	£300	£1,460
Actual Expense . .	£2,510		
Charged per Costs . .	2,470		
Undercharged. . .	£ 40		

EXAMPLE XVII

Two Manufacturing Departments (P and Q) of a business contained 30 and 10 machines respectively. The working days number 300 of 8 hours per annum. Lost time, 10 per cent of the whole. The works expense was as follows—

	P.	Q.
	£	£
Building Service (Rent, Rates, Heating, Lighting, Cleaning, and Maintenance)	150	100
Power Service	1,270	952
Tool Service	525	345
Plant Maintenance	1,456	864
Plant Depreciation	750	520
Stores Service	145	122
Transport and Labouring . . .	420	354
Management and Supervision . .	255	147
	£4,971	£3,404

WORKS E


EXPENSE INCURRED
FINANCIAL ACCOUNTS
Invoices
Journal
Cash Book
Wages Book (Indirect Wages, Salaries, etc.)
Dr. Nominal Accounts
Dr. Profit and Loss Account
Cr. Cash, Supplier, Depreciations etc.
OVERHEAD CHARGED
COST ACCOUNTS
Overhead Rates fixed on basis of Expense Analysis
Departmental Rates
Per Wages or Hours Record on Job
Dr. Job
Dr. Completed Work
Cr. Overhead Account
Cr. Cost Dept. Manufacturing Account

Calculate the machine-hour rates, assuming that the wages of machinists are charged direct.

ANSWER

	P.	Q.
Departmental Expenses .	£4,971	£3,404
Hours Worked . .	300 × 8 × 30	300 × 8 × 10
	= 72,000	= 24,000
Less 10% . . .	7,200	2,400
Net Hours	= 64,800	21,600
Rate per Hour . .	4971 × 240	3404 × 240
	64800	21600
	= 18·4d.	= 37·8d.

CHAPTER XI

THE COST LEDGER

RECONCILIATION OF COSTS AND FINANCIAL ACCOUNTS

THE summarizing of results may be carried out in a number of ways, and the most appropriate form for the Cost Ledger depends entirely upon the amount of information which is desired in a particular business and the circumstances of the case.

(1) The Cost Ledger may conveniently be ruled with separate columns for the main headings of expenditure as shown on page 152, and the loose-leaf form is usually found the most convenient on account of the ease with which similar items can be grouped together and completed jobs withdrawn.

COST SHEET

Works Order No. 0621.

Customer W. JONES { Date, 8th October, 19..
Promised, 20th October, 19..
Date completed, 15th October, 19..

Particulars.

10 × 2¼ in. Pedestal Bearings.

	Wages.				Material.		
	Shop 1.	Shop 2.	Shop 3.				£ s. d.
Oct. 10	25 hrs £2	4 hrs. 5/4	18 hrs. 36/-	Oct. 10	Iron Castings	1372	2 10 –
17			10 hrs. 17/-		Brass Castings	1373	2 5 –
					W.I. Bar 1¼"	1374	2 – –
	25 hrs. £2	4 hrs. 5/4	28 hrs 53/-		Steel Nuts .	1375	10 –
Total Material							7 5 –
Total Wages							4 18 4
Factory Expenses—			£ s. d.				
(1) 25 hours @ 2/-			2 10 –				
(2) 4 hours @ 2/6			10 –				
(3) 28 hours @ 4/6			6 6 –				
							9 6 –
					Factory Cost . .		21 9 4
					Office Overhead 20%		4 5 10
							25 15 2
					Profit . . .		4 4 10
					Sale Price . .		£30 – –

Net Profit: 16 5% on Gross Cost.
or: 14 2% on Sale Price.

COST LEDGER

Order No.

Customer.

Particulars.

Date of Order.
Delivery Promised.

SUMMARY OF COST

	Cost per Article
Material .	
Labour .	
Expense .	
Total .	

Dr. *Cr.*

Date.	Details.	Ref.	Special Purchases.				Disbursements.				Stores.				Wages.				Expense.				Total.			Date.	Detail.	Ref.	Amount.		
			Fo	£	s.	d.	Fo	£	s.	d	Fo	£	s.	d	SH Fo	OP A. Hours	£	s. d	Rate	£	s	d	£	s	d				£	s	d.
															SH	OP B.															
															SH	OP C.															

(2) The preparation of costs upon Cost Sheets which are not assembled in the form of a Cost Ledger till the calculations are completed and closed is another method of compiling final results.

This method may be used in conjunction with a well organized filing system in which the original data pertaining to each order are filed; the cost sheet remaining in the docket and being entered up at inspection stages and closed on completion.

(3) In other cases wages and material are summarized on entirely separate sheets, which are combined in the making up of the final cost. This has a certain amount of convenience in enabling the wages and stores sections of the Cost Office to work on the same records without hindrance.

This method is particularly adapted for the use of mechanical posting; an automatic check is obtained and a large amount of detail can be handled promptly.

(4) Actual detail costs of specific items may be taken out only in special cases and the purpose of the accounts is then to give information in the shape of costs of running departments, processes or machines, which will serve to check the results in the detailed calculations and ensure their accuracy.

It is essential to adopt this method when the individual jobs are small in value and complex in detail. It is also useful when the products are mainly standard and variations from the average can be calculated or gauged by special test.

It must be borne in mind that the main points to consider are—

(*a*) The amount of detail required in the Cost Records.

(*b*) That the results must be obtained as promptly as possible.

(*c*) That comparisons of results must be possible both in the total cost of jobs and in the detail of such costs.

The amount of detail required in each cost will vary in every case. Where detailed costs are regularly recorded it is usual for each order which has to be executed in the works to be divided into production orders, each being specified with a works order number, and the costs will be booked against each works order number as the work goes through. A separate Cost Account will accordingly be opened in the Cost Ledger for the works order number and the total cost of each part will be obtained under these heads. The cost of the job will then be found by assembling the totals of the works orders.

Another method which may be adopted is to record costs against part numbers and drawing numbers on each machine or other product with the object of obtaining yet more detailed records, and when this is done the stores and wages charges will be specified against the part numbers, etc., in detail.

It appears preferable from a practical point of view to obtain the cost results in total against works order numbers, and to dissect the charges against these works order numbers over the parts and operations according to the detail shown in stores requisitions and wages tickets, in order to build up the detail cost of manufacture of the assembled parts.

Cost Ledger Ruling.

In some cases a saving can be made in the amount of clerical work required for the recording of overhead details by inserting in the Cost Ledger ruling a series of columns, one for each department in which there is a different overhead rate, inserting also the hours in each case if hourly rates are used. By this means the total of each column furnishes the amount on which overhead for each department is based and this calculation requires to be made only at the conclusion of each job.

In such cases a reserve must be made for the amount of overhead on Work-in-Progress at the time of closing the

books for stocktaking purposes. This will be done by charging the amount to a Cost Ledger Overhead Suspense Account (crediting Overhead Account or Works Expenses Account). The amount of overhead is calculated upon the total obtained from the records in the Cost Ledger of uncompleted jobs. At the commencement of the following period the entry will be written off against the expenses charged to jobs in the current period.

Where, however, the overhead rates are too numerous to make this method practicable, it is essential for the overhead to be summarized week by week with the wages abstract in order to obtain the overhead charges to each job. Where departmental rates are in use the totals of wages in each department on each job may be used for arriving at the department overhead to charge to the Cost Ledger, and the total wages in each department will furnish the total amount of overhead for the period. Where machine rates are in use the overhead charges should be summarized on the Wages Piece Work Notes or Day Work Tickets, and an abstract of these amounts will be required for arriving at the amount of the total overhead and the charges to each job.

Cost Ledger Postings.

The postings to the Cost Ledger will embrace—

(1) Items from the financial books including postings from Purchases Analysis Book for goods supplied direct to contracts, postings from Petty Cash Book for travelling and hotel expenses paid to workmen and others visiting the job and any similar items which do not come through the abstracts of material and wages. In the financial books these items are posted individually or by means of the monthly totals of analysis column provided for the purpose to appropriate accounts and summarized to the debit of Cost Ledger (or Work-in-Progress) Account.

(2) The summary of materials issued from stores prepared from Stores Issue Notes should be recorded in a Materials

Abstract Book month by month or journalized. The details of direct materials are posted to the debit of the jobs concerned, and in the financial books the total of these items come to debit of Cost Ledger (or Work-in-Progress) Account: items chargeable to Expense Accounts, including repairs, are posted to those accounts in the Nominal Ledger, and the total amount is credited to the Stores Account.

(3) Similarly with the wages abstract the total wages on productive work will be charged to the individual jobs in the Cost Ledger and debited in the financial books to Direct Wages for the Cost Ledger Account (or Work-in-Progress Account). Wages chargeable to expense items will be debited to Expense Accounts in the Nominal Ledger and the total amount of wages earned credited to the Wages Account.

(4) Overhead postings will be made from an overhead or works charges summary to the debit of the jobs in the Cost Ledger and in the financial books for the debit of Work-in-Progress Account; the total will be credited to Overhead (or Works Expenses) Account.

(5) It may be desired to include all charges against the job in the Cost Ledger Account and so to debit each account with the amount of General Overhead chargeable to it on its completion, also to credit the sale price and debit the resulting profit.

(6) Transfers from other Cost Accounts, e.g. from Stock orders for batches of standard parts which are still in progress.

(7) When the job is complete the cost account must be made up and closed; and a monthly summary of closed cost accounts should be agreed with schedule of goods shipped from works or put into warehouse. The credit to the job will be:

(*a*) Works cost, if general overhead and profit are not included in Cost Ledger entries; in the financial books Work-in-Progress Account is credited and Trading or Finished Goods Account debited.

(*b*) Gross cost, if general overhead is charged in the Cost Accounts; in this case a summary of general overhead charges will be made as the jobs are closed. In the financial books the entries will be as in (*a*), the total of general overhead being credited to General Overhead Account and debited to Work-in-Progress Account monthly.

(*c*) Selling Price, if the profit on each job is to be shown: in the financial books the entries as in (*b*) will be required, but a summary of the Cost Ledger Profit and Loss balances will agree with the profit shown by the Trading Account.

Each Cost Number requires a separate folder or filing case in the filing system. This folder will contain the copies of original order; works orders; wages and stores notes, etc., as these pass through the Cost Department, and when making Cost Ledger postings the original wages tickets and stores requisitions should be available for checking off with the works order and specification, so that an independent check will exist by which it is ensured that the book-keeping records against the job will actually tally with the wages and materials expended upon it.

A complete detailed cost of each job (or of special jobs only) showing material, labour, and expense in connection with each part and operation may be made by referring back to stores issue notes and wages tickets.

Classes of Orders.

A natural division will fall into the following groups—

(1) Sales Orders classified in suitable sections;
(2) Sales Repair Orders;
(3) Stock Orders;
(4) Works Extension Orders;
(5) Guarantee and Maintenance Orders.

Each class of order should be easily distinguishable by colour of form used, or by a coding number.

Stock Orders (3) are for the preparation in bulk, of

parts required in the assembly of Sales Orders ; such parts on completion will be deposited in " Finished Stores." In a factory producing standard articles they will form the earlier stages of almost all the work executed.

Orders for works repairs may be carried out in the same manner as if the work was for outside customers ; full detail of time and materials used being recorded, but to simplify these records it is often the rule to charge up to Standing Orders numbers instead of to individual accounts.

The amount of clerical work required in the abstracting of material and wages can be very considerably reduced by the use of mechanical methods. Stores issues, instead of being summarized by hand in order to ascertain the total charges to jobs, should be sorted into job numbers and mechanically listed. Similarly with wages dissections ; if a separate wages ticket is provided for each job, the tickets, having been agreed with the men's total time for the preparation of the pay roll, should be re-sorted and listed to obtain the charges to the jobs. In large businesses, by the use of the sorting and tabulating machines, the method adopted is to punch a card for each item of stores issued or each wages item and by first sorting to obtain the credits to the Stores Accounts or to individual workmen, and afterwards re-sorting under the job number, the charges to the job are obtained automatically. This method has the advantage not only of reducing the actual clerical work, but of furnishing the results in a very much shorter space of time.

The same advantage is obtained in compiling periodical statements of cost results ; the mechanical sorting and summation reducing considerably the time required for the work.

Repairs and Extensions.

When work of this nature is undertaken by the employees of the works it is advisable to distinguish clearly at the outset whether the charge is to be made against revenue as a repair or renewal, or whether it is to be placed to the charge

of capital outlay as an extension. In order to avoid the complication which arises in the financial accounts where overhead is charged on repair work:

(1) Resulting in charges being brought into the financial books for repairs in excess of the actual outlay, and

(2) Increasing the total expenses beyond the actual figure,

it is advisable not to charge overhead upon repairs.

For this reason it is preferable for repair charges not to be made against separate cost accounts in the Cost Ledger. This can be avoided by dealing with repairs under expense symbols and numbers and using special subdivisions of these expense numbers when the cost of individual items is to be obtained, and such items can be abstracted independently for control and statistical purposes. The handling of overhead is considerably simplified if this can be arranged at the outset.

When indirect expense is added in computing cost of repairs, such an amount should be set off against overhead expenses of departments in which the work is performed; and deducted from the total establishment expense obtained. This is illustrated in the schedule, page 124.

In the case of extensions and additions to plant the position is different because such items may be correctly regarded as productive work and the cost of them is not only the material and wages laid out, but the actual amount of works charges incurred upon them; and the usual rates of works overhead for the departments in which the work has been done may be charged upon such work.

In some cases a more conservative method is adopted of only charging a low rate of overhead upon extensions and this has the effect of keeping the plant, etc., accounts at a lower figure than would otherwise be the case, and consequently reduces later the charges for depreciation.

Productive Services.

In some departments the nature of the work makes it

difficult to allocate the charges specifically to each job, and it becomes an advantage to summarize all such charges to one account and to charge the job for the service performed at a standard scale. Typical items of this kind would be Painting and Packing Departments, and a Test Department can be satisfactorily run on a similar basis. The wages and materials and works expenses of each department are then charged to a Cost Account for the department in the Cost Ledger, which is credited with the charges made to individual jobs which have passed through the department. A standard scale is fixed in each department by which different jobs will be charged according to the average of similar previous cases. In the Test Department it is important that a statistical record should be kept of the cost of each test for future reference.

The following Test Department Account will illustrate the plan adopted.

TEST DEPARTMENT

To Direct Wages per Abstract	.	By Charge on Jobs—	
„ Sundry Materials . . .	.	No.	.
„ Salaries per Allocation . .	.	No.	.
„ Power used—do. . . .	.	No.	.
„ General Works Expense—do.	.		
„ Balance of Charges in excess of Expenses carried to Monthly Trading Account (if any)	.		
	£		£

It is usual for a Foundry Account to be dealt with in a similar manner.

Balances arising on these accounts should be written off month by month to the Manufacturing Account.

Drawings, Tools, Jigs, Dies, Patterns, Etc.

The best method of dealing with the items under this head will depend upon the nature of the work for which they are undertaken. Where the jobs are standard and in no way special the charges incurred will be capital outlay and should be charged to Tools, Patterns, etc., Accounts, and written off through the works overhead to

the job accounts, spreading the outlay over a limited number of years (say 3 or 5).

Where the work is special and it is not expected that the same work will have to be repeated it becomes obvious that all charges of this nature must be made part of the cost of executing the order and the entire cost must be written off against the job in hand.

Where, however, although the work is not standard, it can safely be expected that there will be repeat orders the number of possible repeats within a reasonable period whether 5, 10, or 50 must be estimated and a proportionate amount written off the cost of the initial outlay against each job.

The time of draughtsmen should be booked as far as possible to the drawings undertaken, and a percentage may be added to salaries for materials and expenses of drawing office.

A Pattern Ledger will contain records of costs of Patterns and amounts written off to Jobs or by means of Expense Rates.

Development, Research and Experimental Work.

Expenditure under the above headings will be charged in the first place to special accounts descriptive of each item; and, subsequently, will be written off either to special jobs, or through Works Overhead, probably over a short period of years.

Waste and Scrap.

It is generally sufficient to credit the Manufacturing Account with the value of waste, etc., as and when sold; or to be more exact the waste should be passed into the stores to the debit of Waste Account under classified headings and the jobs concerned proportionately credited. The sales effected will then be credited against the Stores Accounts and losses carried to Stores Depreciation.

A difficulty arises where there are by-products utilized in further processes.

1. The by-products may be charged to the processes which handle them at the market price, if this is obtainable.

2. Where there is no market price and the material must consequently be regarded as having no value, where in fact it may be a matter of expense to dispose of it at all, it is obvious that no charge can be made against a subsequent process for dealing with such residue, or a nominal standard value may be used.

3. The by-products which pass through subsequent processes may be credited to the process where they arise at ultimate value or selling price *less* cost of subsequent treatment.

A more difficult problem arises where material bought in one form is partly used in a number of different ways, e.g. material which is cut up and portions utilized for different purposes, e.g. skins which are cut up for different uses, timber cut up to obtain special parts for particular purposes are cases of this kind. In order to charge a fair amount of the original cost against each lot, an estimate of the value of the material in its final form may be used as a guide and the original cost may be apportioned accordingly.

Multiple Costs by Analytical Methods.

In many businesses, owing to the detail in costing, it is preferable to compile the cost sheet for each batch or order as the work proceeds through its various stages. The initial entries are made use of for this purpose by assembling them on a work ticket for each job.

A work ticket is provided, on which the different stages of manufacture and list of essential materials will be printed. This ticket proceeds with the work round the departments and at each stage when material is issued the storekeeper enters particulars and value. Similarly the wage for each process is entered as it is completed.

Overhead is added to wage recorded by means of a percentage; or a series of rates is used for different departments; and in some cases a portion of the overhead is allocated to material and added as a percentage to each item of material used.

The records then obtained consist of a series of results appertaining to individual orders and these will require to be reconciled with the financial accounts to ensure that the results are not merely approximate and of the nature of estimates : to effect this the cost tickets for all completed work must be summarized weekly to arrive at the total of materials charged; wages charged; and overhead added. This summary will then be comparable with the financial records.

This method is suitable for clothing factories; glove making; boots and shoes; hosiery; furniture, and many other similar trades.

In the printing trades a special method based on this principle is used, the overhead on material being especially to cover cost of maintaining purchase department, warehousing and handling of paper, etc., and the rates of overhead being subdivided in the form of machine rates for work done and departmental shop rates on wages to cover expenses in each department.

Reconciling Cost Accounts and Financial Accounts.

When the financial accounts are not framed upon lines which enable a link with the cost system to be established, the agreement of the two systems, in order to show that the profit obtained in the costs is also revealed in the Profit and Loss Account, must be sought as follows—

Wages Account in the financial books must be dissected to obtain— Direct Wages. Indirect Wages.	**Direct Wages total will be capable of close agreement with wages charged to Cost Ledger.**

Purchases Account in the financial books must be dissected to obtain— Direct Materials. Indirect Materials.	Direct Materials used— i e. Stocks of Direct Material at commencement of period plus purchases, less Stock at close of period should agree within close limits with Materials in Cost Ledger.
Expenses chargeable to specific Jobs should be separately posted in financial books and, if not, must be obtained by dissection.	and will agree with similar items in Cost Ledger.
Summary of Works Expenses must be obtained from above dissection of Wages and Material with the items of Works expenses from Profit and Loss Account of the financial books.	Measure of agreement with Works Overhead in Cost Ledger will indicate accuracy or otherwise of Overhead Rates and need for adjustment

General Expenses obtained similarly and agreed similarly with General Overhead.

Financial Books.

In the financial books the accounts should be framed on the plan illustrated on page 165. Materials used are credited to Stores Accounts which then show balances representing Stocks on Hand. A Manufacturing Account is debited with material, wages, and factory overhead, and credited with finished goods at factory cost. The Finished Stock Account is debited with the same total for goods manufactured; and the balance of this account, allowing for increase or decrease in stock, gives the cost of goods sold. This amount will be debited, along with any overhead balances from Overhead Adjustment Account to a monthly Trading Account

The Journal entries and Ledger Accounts following make this clearer.

MARCH 31ST, 19..

	£	s.	d.	£	s.	d.	£	s.	d.
Manufacturing Account—				*Dr.* 16,253	–	–			
To Purchases Account for (*a*) direct purchases per Invoice Analysis Book . .	597	15	–						
(*b*) Stores Issued per Stores Issued Book .	3,082	5	–						
							3,680	–	–
To Chargeable Expense Account for disbursements chargeable to Customers per Petty Cash Analysis. . .							117	5	–
To Productive Wages Account for total per Wages Summaries .							6,205	15	–
To Salaries chargeable direct							850	–	–
To Factory Expense Allocation Account for Works Expenses Chargeable per Overhead									
Shop No. 1. . .	2,783	–	–						
,, No. 2. . .	1,443	–	–						
,, No. 3. . .	1,174	–	–						
							5,400	–	–
per Nominal Accounts									
Finished Stock Account—				*Dr.* 16,033	17	6			
To Manufacturing Account for completed work per Cost Ledger Summary							16,033	17	6
Trading Account—				*Dr.* 15,933	17	6			
To Finished Stock Account for value of Goods sold . . .							15,933	17	6

FINANCIAL BOOKS

SHOWING CONTROL AND AGREEMENT OF COSTS

MATERIALS ACCOUNT (STORES CONTROL)

Comprising all Stores and Issues to all Jobs

		£	s	d.		£	s	d.
Jan. 1	To Stock at commencement of period	1,572	10	6	By Stock at end of period carried down	1,977	3	6
31	,, Purchases	1,079	8	4	,, Manufacturing Account—materials used (As charged to Jobs per Issue Notes *less* returns.)	3,082	5	–
Feb. 28	,, Purchases	983	10	7				
Mar. 31	,, Purchases	1,564	3	5	,, Works Expenses Account (As charged to Expenses per Issue Notes)	124	19	9
					,, Works Expenses Account—Stores Adjustment (In respect of Stores not accounted for, Waste, Errors, etc.)	15	4	7
		£5,199	12	10		£5,199	12	10

NOTE. Detailed Stores Accounts, which are also kept for each article, are *statistical* accounts.

WAGES ACCOUNT

		£	s.	d.			£	s.	d.
Jan. 31	To Cash	2,742	4	5	By Manufacturing Account—Direct Wages (As charged to Jobs per Time Sheets, etc.)		6,205	15	–
Feb 28	,, Cash	2,856	9	8	,, Works Expense Account—Indirect Wages (As charged to Expenses Account per Time Sheets, etc.)		2,932	10	7
Mar. 31	,, Cash	3,544	13	10	,, Works Expenses Account—Wages not allocated		5	2	4
		£9,143	7	11			£9,143	7	11

MANUFACTURING ACCOUNT

Combining the total transactions affecting all the Cost Accounts, compare Cost Ledger Summary. When Cost Accounts are kept on double-entry principles a similar account arises with the sides reversed.

To	£	s.	d.	By	£	s.	d.
Value of Work-in-Progress at Opening Stocktaking	1,502	7	6	Work-in-Progress at end of period	1,721	10	–
,, Materials Used—				,, Cost of Finished Goods completed during period (per Financial Accounts)	16,033	17	6
Special Purchases	597	15	–				
Stores Issues	3,082	5	–				
,, Disbursements on Special Jobs	117	5	–				
,, Direct Wages	6,205	15	–				
,, Salaries	850	–	–				
,, Works Expenses (details shown in Cost Dept Works) (Expenses Account)	5,400	–	–				
£	17,755	7	6	£	17,755	7	6

FINISHED GOODS ACCOUNT

To	£	s.	d.	By	£	s.	d.
Stock of Finished Goods	427	10	9	Stock at end of period	527	10	9
,, Cost of Goods made	16,033	17	6	,, Cost of Goods sold	15,933	17	6
£	16,461	8	3	£	16,461	8	3

TRADING ACCOUNT

	£	s.	d.		£	s.	d.
To Cost of Goods sold per Finished Goods Account . . .	15,933	17	6	By Sales	21,075	–	–
,, Gross Profit	5,141	2	6				
£	21,075	–	–	£	21,075	–	–

PROFIT AND LOSS ACCOUNT

	£	s	d.	£	s	d		£	s	d.
To Office Expenses—							By Gross Profit	5,141	2	6
Salaries . .	1,000	–	–							
Traveller . .	750	–	–							
Advertising . .	1,200	–	–							
Sundries . .	1,050	–	–							
				4,000	–	–				
,, Net Profit . .				1,141	2	6				
				£5,141	2	6		£5,141	2	6

Work-in-Progress Account.

The Work-in-Progress Account (also referred to as a Manufacturing or Cost Ledger Account) in the financial books will take the form of a controlling account for the Cost Ledger. All the items debited to the individual cost accounts form part of the totals which are debited month by month to the Work-in-Progress Account. Against these debits there will naturally be credits in the financial accounts to wages, stores, overhead, etc. The account will be credited with works cost of completed work transferred direct to Trading Account or Finished Stores.

Where this system is carried out it seems unnecessary to use a double entry form of accounts in the Cost Ledger itself. The Cost Ledger will become a detailed record similar to a Sales Ledger or Purchases Ledger where there is in the General Ledger a controlling account in the shape of a Bought Ledger Aggregate Account and Sales Ledger Aggregate Account. At the same time it is essential for stocktaking purposes that details of the Cost Ledger Accounts should be summarized and the total agreed with the balance of the Work-in-Progress Account in the financial books; and any difference arising must naturally be traced if possible or written off. Further, there should be an inventory taken of the actual work in progress on the floor of the shops from which the Cost Accounts can be controlled.

A series of Work-in-Progress Accounts may be arranged; one for each type of product or manufacturing department.

SUMMARY OF COST JOURNAL ENTRIES

AND COMPARISON WITH FINANCIAL BOOKS

	Cost Ledger		Financial Accounts	
	Dr.	*Cr.*	*Dr.*	*Cr.*
Wages	Cost Accounts (in detail)	Wages A/c	Productive Wages Account	Cash
Special Purchases	Cost Accounts (in detail)	Purchases A/c	Purchases Account	Supplier
Stores	Cost Accounts (in detail)	Stores A/c	Purchases Account	Supplier
Disbursements	Cost Accounts (in detail)	Expenses A/c	Chargeable Expenses Account	Cash

Cost Ledger (*continued*)	*Dr.*	*Cr.*	Financial Accounts (*continued*)	*Dr.*	*Cr.*
Expenses (i.e. Overhead)	Cost Accounts (in detail)	Overhead A/c	General Expenses A/cs.		Cash or Supplier, etc.
Overhead on Work-in-Progress	Overhead Suspense A/c	Overhead A/c			
Value of Work-in-Progress	Total of open Job Accounts (including Works Overhead)		Work in Progress (i.e. Stock)		Manufacturing Account

CLOSING ENTRIES

			Dr.	*Cr.*
Sales Orders	Manufacturing Account	Cost Accounts (in detail)	Trading Account	Manufacturing Account
Sales Repair Orders			"	
Building and Plant Repairs			Repairs Account	
Building and Plant Additions			Plant, etc. Account	
Stock Orders			Stores Account	
Tool Orders			Tools Account or Repairs Account	

Entries reconciling difference between actual expenses and overhead charged; or difference between Cost Ledger profit and Profit and Loss Account profit—so far as made up of the same factors (i.e. excluding Investment Income received, etc.).

Trading Account *Dr.* or *Cr.* for difference in Works Overhead	General Expenses Account *Cr.* or *Dr.*
Profit and Loss Account *Dr.* or *Cr.* for difference in Office Overhead	

The balance of the Cost Ledger Manufacturing Account carried forward will form a credit entry, agreeing with the debit balances on uncompleted Jobs, shown in Cost Ledger Summary.

Values of Stocks in Stores Account, and Sales Account for selling values of completed work may be introduced into the system as in the example illustrated.

Monthly Summary—Monthly Balance Sheet.

A Monthly Summary abstracted in detail will show—

(1) Total of completed work; grouped in sections according to arrangement of Cost Ledger Accounts; and showing details of expenditure on each order number.

(2) Total of Work-in-Progress for balancing with financial accounts; the financial accounts Work-in-Progress Account may be arranged in corresponding sections and balancing is thus facilitated.

(3) When the General Overhead and Profits are not shown in the Cost Ledger (as is often desired for reasons of privacy) the summary provides means for ascertaining whether the margins on each contract are sufficient to cover administration expense and amount of profit on each. This requires a definite percentage on Factory Cost which can be checked month by month from the Counting House Nominal Ledger Summary of Expenses, and inquiry is at once possible in cases where the requisite percentage is not reached.

(4) When a Monthly Balance Sheet and Trading Account are required the Work-in-Progress Account will furnish the value of Work-in-Progress and the Stores Control Account will furnish the value of stocks on hand.

The Cost Accounts should also be systematically checked with the estimates on completion of each account, to discover errors by under or over-estimating and to inquire into all unsatisfactory results.

What the Cost Accounts Show.

The Cost Accounts will reveal—

(*a*) The profit or loss on particular work at different times and cost of stock lines;

(*b*) Means by which economical working or more economical processes may be secured and expenses controlled;

(*c*) Leakages in respect of time and material through inefficient use.

The Cost Accounts further supply—

(*d*) Periodical Profit and Loss Statements independently of the financial accounts;

(*e*) A basis for future estimates; and they will also indicate—

(*f*) Possibilities of increased production;

(*g*) Opportunities of reaching wider markets by reducing prices.

The Cost Accounts will be called upon to provide data on which decisions will be based as to future operations, and the following information in particular must be made available—

Whether certain work contributes its share to the general burden of expense.

Whether the production of a certain class of goods causes additional expense which other articles are compelled to bear.

Whether the capital and energy spent on any specialities could be better employed elsewhere.

Whether it really pays to produce a certain class of goods at a small profit or at a loss, bearing in mind the possibilities of securing lucrative trade thereby in other goods.

In addition to the cost of manufacture and expenses of marketing, there are many factors which may affect the fixing of a selling price including competition, demand, duration of demand, requisite capital outlay and return obtainable on same in comparison with yield on other manufactures.

SALES

SALES

FINANCIAL ACCOUNTS

Sales Day Book

Dr.
Customer

Cr.
Sales A/c

Cr.
Trading or
Manufacturing A/c
(Sale Price)

COMPLETED WORK

COST ACCOUNTS

Cost Ledger Summary

Dr.
Completed
Work A/c

Dr.
Cost Dept.
Manufacturing A/c
(Cost Price)

Cr.
Job A/cs

CHAPTER XII

FOUNDRY ACCOUNTS

A FOUNDRY or forge is always treated as a separate department in Cost Accounts. A foundry record shows particulars of the meltings each week ; weight of material mixed (less scrap and spoilt work) and details of castings made. The working expenses are summarized in full detail, and the week's allocation is brought into the cost sheet.

The cost of material used in each mixing is charged to the castings produced in proportion to their final actual (or calculated) weight.

The expense cost for the week is similarly charged to the castings on the basis of weight ; the total expense divided by the total weight produced, giving a charge per cwt. to be made to each casting.

WEEKLY COST RETURNS

(*a*) SUMMARY OF LABOUR AND PRODUCTION

Week ending_____

Direct Labour.	£	s.	d.	*Production* CWTS.	QRS	LBS	*Cost. Per Cwt.*
Cylinders	16	7	–	34	–	–	9/7 41
Bench	16	4	6	37	–	–	8/9·16
Tool	11	12	–	20	1	–	11/5 48
Plate Work	17	11	–	65	–	–	5/4·8
Floor	12	9	–	54	1	–	4/7·08
Weights (no cores)	1	–	–	10	–	–	2/–
	£75	3	6	220	2	–	

Indirect Labour.	£	s.	d.	*Production.* CWTS.	QRS.	LBS	*Cost. Per Cwt*
Labourers, etc.	17	4	–	220	2	–	1/6·72
Firemen.	9	16	6	220	2	–	10·67
Softener.	3	17	4	220	2	–	4·20
Stretcher	4	7	6	220	2	–	4·73
Pattern Finder	3	15	1	220	2	–	4·08
Coremakers	13	16	–	210	2	–	1/3·16
Dressers.	16	8	–	220	2	–	1/5·85
	£69	4	5				6/3·41

(*b*) MATERIAL SUMMARY

Week ending_____

Direct Material—	£	s.	d	£	s.	d.	*Cwt.*
C. Q. L.							
Pig Iron 154 2 0 @ £24 ton	185	3	3				
Scrap (30%) 66 0 0 @ 10/7½ cwt.	35	6	–				
				220	9	3	
Total . . .							19/11·5
Sundry Material—							
C. Q. L.							
Sand . 60 0 0 @ 11/4 ton	1	14	–				
Limestone 7 0 0 @ 50/- cwt.	17	10	–				
Sundry Material . . .	1	–	3				
C. Q. L.				20	4	3	
= 220 2 0 @ 1/10							
Core-making Material—				1	15	1	
C. Q. L.							
= 210 2 0 @ 2d							
Total . . .							2/–
Castings with cores 2/–, without 1/10							
Coal and Coke—				87	10	–	7/11
25 tons @ 70/- . . .							
Overhead Expenses . .							3/–

Record of work done is made by each man on a Weekly Casting Card. Two columns are provided: "Weight Cast"—"Weight Passed." The weight passed is summarized for the Production Records (*a*). Wages are paid at weekly rates, and an abstract of wages classified according to type of work gives the average wage cost of each class of castings. Material summarized on Material Record (*b*).

FINISHED COST OF EACH CLASS OF CASTINGS PER CWT.

Week ending_____

	Materials	Direct Labour.	Coal and Coke	*Sundry*		Sundry Exps	Gross Cost.
				Labour	Material		
Bench . .	19/11·5	8/9·16	7/11	6/3·41	2/–	3/–	47/11
Plate . .	19/11·5	5/4·8	7/11	6/3·41	2/–	3/–	44/8
Floor . .	19/11·5	4/7 08	7/11	6/3 41	2/–	3/–	44/–
Cylinders. .	19/11·5	9/7·41	7/11	6/3 41	2/–	3/–	48/10
Tools . . .	19/11·5	11/5·48	7/11	6/3 41	2/–	3/–	50/8
Weights . .	19/11·5	2/–	7/11	5/0·25	1/10	3/–	39/9

FINAL COST ACCOUNT

Week ending_____

PRODUCTION

	CWTS	QRS.	LBS.	CWTS	QRS	LBS
Bench . . .	37	–	–			
Floor . . .	54	1	–			
Plate . . .	65	–	–			
Tool . . .	20	1	–			
Cylinders . .	34	–	–			
Weights . . .	10	–	–	220	2	–

COST.

	£	s.	d	£	s	d	£	s	d.	£	s.	d.
Material Direct—												
Pig Iron . . .	185	3	3									
Scrap	35	6	–									
				220	9	3						
Wages . . .				75	3	6	295	12	9			
Material Indirect—												
Sand	1	14	–									
Limestone . .	17	10	–									
Coremaking . .	1	15	1									
Sundry . . .	1	–	3									
				21	19	4						
Wages Indirect .				69	4	5						
							91	3	9			
Coal and Coke .							87	10	–			
Overhead Exps., Weekly Allocation . .							33	1	6			
										£507	8	–

	CWTS	QRS.	LBS			
Cost of Producing . .	220	2	–	of Good Castings	£507	8 –

Alternative methods may be used for treating Indirect Wages and Overhead Expenses which are more suitable when the variety of castings is great. The amount of Direct Wages is used in determining the expense allocations entirely; or in conjunction with the basis of weight.

FOUNDRY COST SHEET

The cost of metal is calculated for each mixing by including Raw Materials, as—

	£ s. d.	£ s. d.	£ s. d.
Pig Iron	£185 3 3		
Scrap	35 6 –		
Limestone	17 10 –		
Coal and Coke. . .	87 10 –		
Wages of cupola and furnace men . .	9 16 6		
			335 5 9
equal to 220½ cwt. at 22/6 cwt. and based on the weight of each casting.			
Direct Wages are booked to each job by—			
Moulders + % for Material	75 3 6	+ 1 14 –	
Coremakers + % for Material	13 16 –	+ 1 15 1	
	£88 19 6	£3 9 1	3 9 1
and a percentage is added to cover the cost of Indirect Labour, say, 52% .	45 11 11		
			134 11 5
Sundry Material and Overhead Expenses are added at a percentage on total labour, say, 25% .			34 1 9
			£507 8 –

The Overhead Expenses chargeable to each group may be determined by the total wages of the group and a cost per cwt. in each group thus arrived at.

Where the Foundry is a department in an engineering works the cost of castings made should be compiled week by week and the castings sent into stores at cost price, i.e. Works Cost. Castings are then drawn from stores for jobs as required on Stores Requisitions.

The practice of charging castings to stores at market price in order to show a profit on foundry work is unsound in creating an artificial profit which may not be realized.

If the Foundry is running at a loss the market price should be used and the loss written off at once.

The profit on the foundry will be shown by a comparison of the current costs with the market price for similar work whether the castings are for stock or for sale immediately; and a Foundry Trading Account can be compiled to show the profit on sales of castings if desired.

CHAPTER XIII

WORKS ROUTINE

ONE of the most valuable aids to the economical running of a factory is an efficient Planning Department, whose duties consist of—

(1) Saving of time by having work prepared for putting in hand immediately machines are at liberty;

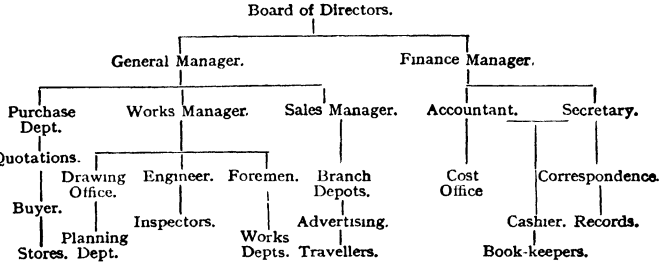
(2) Preventing delay in the progress of work through various departments;

(3) The arranging of orders to provide for the prompt execution of urgent work;

(4) The supervising of stores to maintain stocks to meet orders at hand.

The concentration of these duties upon a special staff will make for increased efficiency in handling the work.

To systematize the general routine a diagram of duties and responsibilities may be set out in the following form—



The success of a business is considerably influenced by the extent to which the technical management obtains criticism and assistance from the financial direction. In view of the fact that forecasts of production and estimates of the cost of manufacturing orders about to be undertaken are based upon the cost records of past work, it follows that promptitude and accuracy in the furnishing of costs are of greatest importance to efficient management, and the arrangement of works routine has an important bearing

upon the facility and accuracy with which cost records can be obtained. This does not imply that detailed individual job costs cannot be dispensed with to some extent where results can be obtained in group form, e.g. by departmental methods, because in such cases individual costs can be calculated from known details, and group records exist to prove the accuracy of the calculated costs. So that to some extent the clerical work involved in obtaining continuous costs may be reduced. In other cases this method is not possible owing to the variety in the work undertaken and an efficient method of Job Costing must then be used.

Estimating Department.

Taking for the purpose of illustration the case of an engineering works, the original handling of inquiries will be dealt with by an Estimating Department, and in framing their tenders the Estimating Department should have at their disposal the results of previous work in the form of Cost Summaries. They will also be in touch with the Stores and Buying Departments in connection with the stock and prices of materials, and with the wages and piece-work departments in respect of wages and piece-work prices, and should be advised of changes in overhead rates. Obtaining from the Drawing Office detailed drawings and material specifications they will be able to prepare estimates in detailed form which will be available for comparison (when the work has been executed and costed out) with the actual cost results, and variations in the cost of work from the amount of the estimate can thus be traced. Assuming that an order is received to be executed for a customer or that sanction is given for manufacture for stock, the Estimating Department will hand over the information they have obtained on the subject to the Planning Department, copies of the order or Master Card being at the same time circulated to other departments interested, e.g. Drawing Office, Jig and Tool Department, Buying Department, Progress Office and Cost Office.

Each Works Order will be given a serial code number denoting class of product and number in series. Sub-order numbers will similarly be allotted to part orders, details of same being recorded on main order.

The Drawing Office will revise the drawings to be used on the job and prepare exact specifications of the material required which they will hand over also to the Planning Department.

The Planning Department from the Master Card prepares a Works Order for each section or principal part of the machine to be manufactured, copies being circulated as above, and such Works Order should be accompanied by material specification for the material required for its execution. The separate jobs to be undertaken in the manufacture or assembly of the particular part will require a Job Card giving details of the work to be done, measurements and so on. The Works Orders with drawings and Job Cards are passed to the Rate-fixers or Piece Work Office who schedule on the Job Cards the processes required, and prepare the Piece Work or Day Work Tickets for each item, fixing the Piece Work prices and inserting same on the Piece Work Tickets and Job Cards. The Job Cards will then be sent direct to the Cost Office ; or be retained by the timekeeper in the shops for record of the time taken to be inserted.

The foreman is supplied with the Works Order, Wages Tickets and Material Specification and will prepare requisitions for material as he requires it. When obtaining material he will present to the storekeeper the Material Specification on which the storekeeper will record the date against each item supplied, at the same time obtaining the workman's signature on the Stores Requisition Note which is passed to the Stores Office. The Wages Tickets are sorted by the foreman so that he can have ready for each man a series of jobs to be taken up one after another, and a rack should be provided marked with the men's numbers in the shop so that the piece work notes for each man can be inserted under his number.

As a job is finished the Time Clerk should record the exact time on both finished and new jobs, thus ensuring that accurate time recording is obtained. In the event of a foreman not having a job ready or if the workman has to wait for a job to be brought, then a separate time ticket should be used to record the waiting time between one job and the next. The finished Wages Tickets should be sent day by day from the shops to the Wages Departments, where they will be required in calculations for bonuses, and after the pay roll is completed and the bonus paid the wages Tickets should be sent to the Rate-fixing Department so that the information obtained can be compared with a view to correct rate-fixing. At each week-end the Wages Tickets of unfinished jobs must be collected and fresh tickets issued in exchange by the foreman for the following week. The Job Card will require to be entered up with the amount of wages paid for each process on the job as shown by the Wages Tickets, and this can be done either by the time-keeper in the shops or by the Cost Department who for this purpose will require the Wages Tickets to be handed to them by the Wages Office after the completion of the Pay Roll and before the Wages Tickets are returned to the Rate-fixers.

It is preferable for work to be inspected before a bonus is authorized, and this can be done so as to allow time for calculation of bonuses when the wages payable on Friday or Saturday are made up only to the previous week-end. The actual Piece Work Notes can then be summarized in the Wages Office to obtain the wages payable.

In cases where wages have to be made up to Wednesday or Thursday night and paid on Friday or Saturday, the margin of time is insufficient for this to be done. The wages payable will then consist of Time Rates for the actual hours worked, plus excess of Piece Work bonus above Time Rates for the week previous. In any event the day wages and Piece Work bonus will agree with the total of the Wages Tickets, and the charges to the job

will be made from the abstract prepared from the Wages Tickets.

It is a convenient plan for the shop clerk or time-keeper to keep a serial record of the Wages Tickets given to each man during the week, showing the job number and the total wages earned on each job and distinguishing between Productive work; Repairs and other expenses for other shops; and Indirect Expenses for own shop; and this is available for use in the Wages Office and Cost Department immediately. On the other hand the time-keeper can also keep a record of the work done by different men on the same order number as on the Job Card specified above, thus bringing together the various processes of one job and forming a sub-analysis for Cost Office use, which again facilitates the preparation of Cost Records.

Inspection and Test.

The Piece Work bonus should be authorized by the Inspection Department by the presentation of the work to the View Room before the Piece Work Notes are handed in; or by the signature of the Inspector on the Piece Work Note as he passes through the shops; or by the use of an independent inspection note, which is a duplicate of the Piece Work Note but of a different colour, being sent after inspection to the Wages Office authorizing the payment of the bonus shown on the Piece Work Note to have been earned. The Cost Department will receive advices of the inspection, testing, packing and shipping of all machines and will require to close the costs for such jobs concurrently with the invoicing of same to customer.

A summary should be prepared each month showing in suitable sections the items making up the sales with particulars of the main items of the cost of manufacture against each sale.

Planning and Progress Departments.

In conjunction with the Planning (or Production) Department whose function may be limited to the

arrangement of future work, preparation of Works Orders and specifications and the oversight of Stocks and future supplies of material; the Progress Department will take charge of orders in hand in the factory, watching their route and obtaining records of completed operations; obtaining reports of work held up for supplies of material —congestion of work in particular departments, etc. Diagrams will be used to show the stage which each order in hand has reached.

A production schedule should be laid down in advance and the Progress Department work then consists in facilitating in every way the accomplishment of the forecast.

RATE-FIXING. The difficulties of fixing correct rates for piecework or bonus systems can be overcome only by the skill of the Rate-fixer and his mechanical ability assisted by time studies and the use of detailed records of the time taken on the jobs.

TIME ALLOWANCES. The Piece Rates or Time Allowances fixed by rate-fixers should be stated in terms of time and not as prices per piece; and in addition to stating the time should also specify the machine at which the work is to be done and the grade of labour to be employed.

To secure the co-operation of employees in obtaining maximum output, questions concerning the rectification of rates should be dealt with by shop committees consisting of, say, Foreman, Shop Steward and Rate-fixer acting for the purpose of adjusting any rates which are shown to be too low or too high. In the latter case a safeguard for the employee is sometimes introduced by guaranteeing that no rate shall be reduced without corresponding increase of a rate claimed to be too low.

Mass Production or Repetition Work.

The methods of organization known under this name have for their object the cheapening of production by—

(1) Standardization of work and processes, producing a high degree of efficiency and specialization;

(2) Employment of machines to the fullest extent in order to increase the product per employee ;

(3) Arrangement of factory to avoid loss of time and labour in transferring work from one place to another ;

(4) Saving time by continuous work so that there will be no loss through the changing of jobs ; setting machines ;

(5) Continuous flow of work simplifying wage systems ; oversight and routine.

If these methods can be adopted an increase of output for the same amount of capital will be obtained, and the indirect expense will be reduced. Manufacture will proceed as authorized by sanctions for specific quantities of finished machines. The main difficulty then arises in adjusting different supplies to keep pace with maximum output without overstocking. For this purpose the Components Stores department will keep detailed accounts of stocks of parts and orders in hand.

In various stages of manufacture varying methods may be employed—

(*a*) In the Foundry, costs will be made up as a separate department ;

(*b*) Orders for parts for stock will be put through in large quantities under Works Order Numbers ;

(*c*) Machines will be run continuously on standard work in processes ;

(*d*) Assembly will proceed under direction of Progress Department ;

(*e*) Variations from standard will be made on specific assembly orders.

Costing by Operations.

The special feature introduced in the costing in the case of (*c*) is that in the place of booking the time on particular work to its Order No., the operations which the work has to go through are scheduled and numbered, and time and wages are charged to each operation number. One operation may comprise various processes and each may be

numbered separately so that analytical records of cost at each process are available. Thus, if part " A " has to go through five operations, say A1, A2, A3, A4, A5, and in A5 there are ten processes these will be A5–1, A5–2, A5–3, and so on.

SERIES OF OPERATIONS

Article..... No .....
Date Commenced.....
Withdrawn. .....

Dept.	Operations.	Number.

A series of cards will show operations on each part.

Another series of cards for each sub-process will take the original entries from the wages (time or piece) cards; these Process Cards will be summarized on Operation Cost Cards.

PROCESS COST CARD

Article _____
Operation _____ No_____

Date.	No.	Wage.	Production.	Date.	No.	Wage.	Production

The time cards also show quantities passed by the inspectors at each stage. From these records the Operation Cost Card is written up week by week for every part manufactured, showing—

(1) The average wage cost, in detail, of operations or processes per unit produced;

(2) The material cost booked to the same number, also arrived at per unit completed;

(3) Expense cost added at works or departmental rate.

OPERATION COST CARD

Article_____ No_____

Pattern No_____ Date_____

Operation No.	Dept	Processes.	Average Cost	Average Cost	Average Cost	Average Cost
		Total				

A weekly comparison of wage cost is made to indicate possibilities of more economical workings. Spoilt work will be shown by records of pieces passed at each stage, and this cost must be included in calculating total expense of each operation.

The supplies thus obtained will go into Finished Stores and other supplies of finished parts will be purchased; from these sources the finished machines will be assembled.

A statement of weekly or monthly productions in the following form will be found useful for comparisons—

MONTH ENDING OCTOBER 21ST, 19..

SHOP A. ORDER X1627.

Operation.	Gross Production.	Number of Work-people.	Actual Hours Worked.	Wages Paid.	Production per 50 hours per Worker.	Time per Unit	Wage per Unit.
			Hours.	£		*Minutes.*	*Pence*
Machining 1 .	30,000	31	5,900	350	254	11 80	2·80
„ 2 .	29,500	5	970	50	1,521	1·97	·40
„ 3 .	29,400	9	1,690	70	869	3 44	·51
„ 4 .	29,000	10	2,050	115	707	4·24	·95
„ 5 .	28,970	13	2,450	148	591	5·07	1·22
Fitting . .	28,700	6	1,180	70	1,216	2 46	·58
Grinding .	28,500	5	950	64	1,500	2 00	·53
Inspecting .	28,000	9	1,750	175	800	3 75	1 48
		88	16,940	£1,042		34·73	8·47d

Quantity Passed, 28,000
Average Total Time, 36 3 min
Average Total Wage . . . . . 8 93d.
Cost of Castings — 5/- each equals per unit completed . . 64·28d.
Factory Overhead Expense at 240% on Wages . . . . 21·43d.

94·64d.

Assembling.

The parts required are tabulated in a *Material Schedule*, giving a detailed list of every part in the finished machine.

The work to be done is also tabulated in an *Operations Schedule*, following the numbering for parts adopted in the Material Schedule.

Each operation may consist of several minor processes which are similarly tabulated on *Operation Cards*.

MOTOR PRODUCTION

WEEKLY STATEMENT OF COST PER CHASSIS

*Week ending*_____

	£	£
MATERIAL—		
Purchases of Finished Parts	120	
Stores Consumed per Detail Schedules	185	
		305
LABOUR—		
Machining	20	
Erecting	13	
Foundry	4	
Sundry Labour	5	
		42
		£347
WORKS EXPENSE—	£	
Rent, Rates and Insurance	8	
Coal, Gas, Water, including Heating and Lighting	47	
Wages and Salaries	72	
Depreciation and Repairs	20	
		147
		£494
INDIRECT EXPENSE—		
Rent, Rates and Insurance, Office	3	
Lighting and Heating	2	
Management and Office Salaries	55	
Discounts and Allowances	32	
Travelling, Advertising, Salesmen's Salaries	24	
General Expenses	15	
Interest	20	
		151
		£645

A continual weekly record is then prepared as follows—

In a MATERIAL SUMMARY each part is priced out at its cost price as purchased, or at factory cost if manufactured.

In a WAGES SUMMARY is shown the cost of every operation (and process) according to the time booked to the number representing that operation during the period, divided by number of completed units to show cost of *operation per unit* completed for sale.

SHOP EXPENSE SUMMARY is prepared from financial books for same period similarly divided, and an appropriate percentage may be added to wages at each operation to provide the amount of overhead required.

The total of these schedules then shows total cost per unit week by week, and comparisons of *fluctuations in cost of manufacture* indicate possibilities of economy.

Job Costing.

This method is also worked in conjunction with job costing methods where a machine is completed up to a certain point to standard pattern and then finished to suit customer's requirements.

Standard Costs and Inter-Departmental Trading Accounts.

The method of standard costs is to institute departmental trading accounts in the factory for the purpose of showing the amount which each department gains or loses against the scheduled cost of performing the work allotted to it.

The method appears to have real utility when the work is standard and can thus be used to take the place of detailed job costs.

Each department being charged with the wages paid; indirect materials used, spoilt work and allocations of overhead expenses is credited with the estimated value of the work performed and the profit or loss can be obtained week by week from these records.

Detailed calculations can be made of the cost of special jobs; but the normal cost of completed work will be the

cost of direct material which will from the outset be charged upon it, plus the allowance to each department for work performed.

Overhead rates for departments or machines will be required for such calculated costs and for charging from one department to another any work done in one department originally allocated to a different one.

Duties of Cost Office.

The chief duties of the Cost Office thus are—

(*a*) To maintain correctly the routine in connection with the keeping of the Cost Ledger, entering therein to each account the cost of—

Material from the Requisitions ;

Special purchases and disbursements from the Counting House books ;

Wages from the Wages Abstract ;

Expenses or Overhead at the rates fixed.

(*b*) If responsible for prices, to see that these are based on actual cost.

(*c*) To ensure clerical accuracy by observing that material and wages charged to each contract or order are in accord with the specification of the respective Works Order and that Wages Abstract is agreed with gross wages of Pay Roll ; and Stores Issues Summary agreed with credits to Stores Accounts.

(*d*) To maintain frequent reconciliation between the expense or overhead charged in the Cost Ledger and the current expenses as shown by the financial books.

The Accounts Department should compile the monthly expenses summary with the assistance of the Cost Office dissections ; and the Cost Office uses the monthly expense summary for departmental allocations.

(*e*) To allocate correctly expenses as between departments in fixing rates in accordance with the burden that should be borne by each ; and to distribute such expenses over the work on sound principles.

(*f*) To draw up cost sheets suitable for the works and institute detailed instructions for their use.

(*g*) To take steps to ensure the handing in promptly to the office of the necessary records as compiled in the works, duly certified by the officers responsible (foreman, storekeeper, supervisor), and to take charge of such records.

(*h*) To install a system of preservation of records and of easy reference thereto.

(*i*) To establish methods of routine to keep in touch with the Counting House as to raw material purchased, wages paid, expenses analysed, etc.

The work must always be up to date, and so arranged as to provide information to the management immediately it is called for.

Machines for Reducing Costing Work.

Machines in use for obtaining results more speedily and with less clerical labour include the Burroughs Adding Machine, the Comptometer, and other calculating machines; the Wages Payroll Machine; Ledger Posting Machine; the Hollerith Sorting and Tabulating Machine, the Powers' Machines, and similar appliances. The sorting machines work with cards on which the records are punched instead of being written. The machine can be set to sort these into any desired classification and the totals can be quickly obtained in the tabulating machine. These are economical where the records run into many thousands, but the usual type of adding machine can be put to advantageous use in all large offices.

CHAPTER XIV

OPERATING (WORKING) COSTS

IN this class are included the costing records of railways, tramways and similar concerns performing services rather than producing goods, where there is a single unit as in Single Costs, but of a different type.

Hence the work performed is measured in train-miles, wagon-miles, or ton-miles ; car-miles or passenger-miles.

Classification of expense is made according to the Service departments, such as in the case of railways—

Maintenance of Ways, Works and Stations, including Staff and Repairs ;

Locomotive Power, including Staff, Fuel, Oil and Repairs ;

Carriage and Wagon Repairs, including Staff, Wages and Material ;

Traffic Expenses, including Staff, Stores and Cartage Expenses ;

General Charges.

Motor Haulage.

A more usual example occurs in the case of motor haulage businesses. The costing is made from drivers' diaries of loads carried, which are summarized in a weekly statement. A comprehensive weekly return is then prepared from these statements.

The amounts from the weekly summaries should be totalled week by week until a quarterly sheet is obtained, which should be agreed with the financial books, and thus furnish a valuable analysis of the costs.

The unit of a ton-mile represents the carriage of 1 ton for 1 mile ; so that the total ton-miles is the sum of the products of miles and tons on each load.

THE SYREN MOTOR HAULAGE CO.

SUMMARY OF DRIVERS' WEEKLY STATEMENTS FOR THE WEEK ENDING . . .

						Total Expense and Earnings
Driver . . .	Jones.	Brown.	Fox.			
Machine . .	1	2	3	. .	. . .	
Total Miles . .	150	200	100			
Total Loads in Ton-miles . . .	360	400	150			
Running Costs—						
Wages . .	£6	£7	£4			
Petrol . .	2	3	1			
Oil . . .	–	1	–			
Tyres . .	5	–	–			
Repairs . .	–	15	2			
Licence and Depreciation .	5	10	3			
Total . .	£18	£36	£10			
Cost per Ton-mile	12d.	21·6d	16d			
Earnings . .	£28	£33	£12			
Balance . .	£10	£3 Loss.	£2			
						£

PETROL RECORD

Week ending _____

	Galls.	£	s.	d		Galls	£	s	d.	Miles Run	Miles per Gall.
To Stock . .					By Supplies to Motor 1 .						
„ Purchases .					„ „ 2 .						
					„ „ 3 .						
					„ „ 4 .						
					„ Travelling Account .						
					„ Engineers . .						
					„ Loss in Quantity						
					„ Balance in Hand .						

MOTOR RECORD

No. 1.
Maker: Austin. Description.
Date of Purchase: Cost £1,100.
October 15th, 19..

Week.	Mileage.	Ton-Miles.	Petrol.	Tyres	Repairs	Running Cost per Ton-mile.
Nov. 29	150	360	£2	£5	—	12d

A detailed record of Petrol, Oil, Tyres and Repairs is maintained; also a record of cost in respect of each machine, showing the number of miles run and quantity of load carried in ton-miles.

OPERATING STATEMENT OF ELECTRICITY GENERATING STATION

FOR HALF-YEAR ENDING 31ST DECEMBER, 19..

OUTPUT 200,000,000 UNITS.

			Cost per Unit.			Per Unit.
To Generation of Electricity—				By Sales of Electric Current—		
Coal		£ 305,000	·366d.	Light, Power, Heating	£ 695,000	
Oil, Waste, Water and Stores		12,000	·014d.	Traction	145,000	
Sundries		3,000	·004d.	Street Lighting	3,000	
Compensation Accidents		400			£843,000	1·012d.
Salaries of Engineers		8,000	010d.	„ Rentals—		
Wages		43,402	·052d.	Meters	366	
Repairs—	£			Time Switches	160	
Buildings	3,200			Motors	13,075	·016d.
Machinery	40,400	43,600	·052d.		£856,601	1 028d.
		£415,402	·498d.	„ Sales of Steam	3,000	·003d.
„ Distribution—				Rentals	1,477	·002d.
Salaries	6,000		·007d.			
Wages	26,000		·031d.			
Sundries	3,000		·004d.			
Street Lighting	1,000		·001d.			
Repairs and Maintenance, Mains, etc.	37.202					
		73,202	·045d.			
„ Rent and Rates		44,584	·054d.			
„ Management Expenses, etc.		26,753	·032d.			
		£559,941	·672d.			
Balance to Net Revenue A/c.		301,137	·361d.		£861,078	1·033d

To Interest	£77,600	By Balance	£301,137
„ Income Tax	34,690		
„ Sinking Fund	165,200		
„ Net Profit	23,647		
	£301,137		£301,137

CHAPTER XV

COST RECORDS AND REPORTS

Expense Control.

THE need for correct detail in Expense Accounts cannot be too strongly emphasized, and the allocation of expense should be made on equally accurate lines, so that the expense charged at any point may be traced and verified.

Authority in the Purchase Department may be specifically delegated to those who have close acquaintance with different classes of materials, with buying limits in each case and close control of the exercise of buying discretion may be secured.

Supplies of Sundry Stores and Small Tools to individual shops may be controlled by a system of rationing ; any excess beyond the scheduled allowance requiring special sanction.

The extent to which foremen are familiarized with works expense varies, and there is much to be said for a system by which each foreman is given month by month a summary of such expenses chargeable to his shop as come under his direct control : e.g. cost of indirect labour ; cost of sundry stores ; general repairs ; so that by acquiring his appreciation and interest these and similar items may be economically managed.

On these lines a regular system of expense reports, subdivided in classes corresponding with the responsibilities of director, managers and foremen, and giving the detail of each expense in separate schedules at each stage, may be a means of obtaining effective control of indirect expenses.

Similar management reports on production, with analysis showing production per hour ; per machine per hour ; or

production per man per hour, and comparisons with previous records and corresponding periods of other years, cannot fail to prove their value. Similarly, reports of

SCHEDULE OF WORKS EXPENSE

GENERAL WORKS EXPENSE—			
Timekeepers			
Storekeepers			
Transportation			
Power House			
General			
SHOP EXPENSE—			
Rent and Rates			
Stores			
Insurance, Heat, and Light			
Indirect Wages			
Repairs			
MACHINE EXPENSE—			
Power			
Tools			
Idle Time			

cost per unit in different operations can be adopted in many businesses.

Production Reports.

Where it is possible to arrive at a standard unit of production, the cost of productive wages and shop expenses may be usefully measured in terms of such a unit ; and the number of units per hour of working time in different periods may be usefully compared. Even if the same unit is not applicable throughout the factory, different units may be used in different departments and the advantage of periodical comparisons is obtained.

A common unit may be based upon the number of tons of finished work ; or the number of units of specific articles ; or the products may be individually rated in points based on the number of labour hours estimated to be required in doing the work. Reports are then required to show the number of units per hour week by week from each department and the amount of productive wages per working hour, and consequently wages per unit of work. Similarly shop expenses in each department per working hour and

consequently shop expenses per unit of work. Where a variation of these records shows inquiry to be necessary the details of shop expenses or workmen's time on different jobs will indicate the cause.

In some cases a uniform unit can be applied to the whole of the production of a factory. In the rubber industry, for example, the material will proceed from one stage to another in exactly the same form up to the moulding stage, and will then be treated in the different ways for the purpose of producing different articles. The cost per pound of finished products will not indicate correctly the actual cost of any of the products, but if the assortment of products remain normal the cost per pound will be a useful efficiency index and the individual costs of specific products may be obtained by calculation or will vary in accordance with scheduled percentages above or below the average. The expense of maintianing detailed cost systems can by this means be very largely avoided and a simpler plan of cost resorted to, by which the total weekly or monthly production costed out on the basis of the average cost plus or minus the known percentages, will absorb the direct and indirect charges involved in the production

Cost Records.

In addition to the Cost Ledger Accounts, a detailed record of Buildings, Plant and Machinery should be kept in the Cost Office.

BUILDINGS RECORD. The rulings on the next page for a Buildings and Fixed Plant Ledger will show the information that should be recorded therein. The values must be written down to provide for the time when replacement will have to be made, and the register will show the amount at which each item stands from time to time.

Expenditure upon repairs and alterations should be entered, but is not added to the value.

Expenditure upon additions and extensions must be

added to values at date and depreciation must be increased accordingly.

Sufficient space must be given to each item to allow for additions and notes of repairs.

BUILDINGS AND FIXED PLANT LEDGER

No.	Description.	Location	Original Cost	Date.	Depreciation					Value	Remar
					Yr	%	£	s	d		

PLANT AND MACHINES. A ruling for a Plant Record is given on the next page; a separate account or card serves to record the history of each machine.

The location of each machine must be recorded in an inventory which should be checked off month by month to ensure that all additions are included in the records and that depreciations are correctly allocated.

Works repairs and works extensions, as executed in the factory, will be analysed when completed to determine the charges to be made to Expenses as repairs and renewals, and to Plant Account as additions or extensions.

Card Ledgers or Loose-leaf Ledgers are desirable for the above, and any fuller details that may be required can also be recorded.

DEPRECIATION is usually calculated as a percentage on the value of each asset at the commencement of each year, the rate being fixed so as to reduce the value of each machine to scrap price at the time when its working life will be exhausted. Another plan preferred by some accountants is to write off yearly an equal portion of the

original cost. The former has the advantage of giving a lighter charge in the later years when repairs are heavier.

Either of these methods may be applied to Machinery and Plant; the percentage on cost being distinctly preferable with machines having a short life.

PLANT AND MACHINE LEDGER

No. Purchased _____

Description Cost £_____

Maker Depreciation %_____

Amount £_____

Date.	Depreciation			Value.			Date	Depreciation.			Value.		
	£	s.	d.	£	s.	d		£	s.	d	£	s	d.

REPAIRS

Date.	Particulars.	Ref			
			£	s.	d.

Leasehold buildings are usually depreciated on a special plan known as the "Annuity" method. A fixed annual sum is charged as depreciation, debited to Profit and Loss Account and credited to the Leasehold Account, but this sum is fixed at such a rate as to allow interest on the diminishing balance to be debited to the Leasehold Account

year by year. This is to regard the leasehold as an investment and treat it as earning interest which is credited to Profit and Loss Account accordingly.

Alternatively, the Sinking Fund plan is adopted by which a fixed annual sum is charged against profits and a similar amount is invested either in gilt-edged securities or in Endowment Insurance; interest on the securities should be re-invested, the fund thus accumulating at compound interest.

REVALUATION. It is advisable to check the depreciation calculations by valuations at intervals of a few years.

TOOLS are generally maintained in working order by charging all renewals to shop expenses.

PATTERNS, unless chargeable to specific orders, must be booked to a Patterns Account, and be subjected to a heavy rate of depreciation.

DISCARDED PLANT should be grouped in separate records to which realized values may be credited, and any losses ascertained and written off.

IDLE PLANT. Advices should be instituted by means of which machines not fully used may be transferred to shops where they would be more useful; by this means the need for further purchases may be avoided to some extent.

Shop Rates.

Shop Rates should be recorded in detail in a Rates Book, showing the total expenses under which the factory works; the amounts distributed as Shop Rates; and the resulting overhead against work done.

Details of the cost and how it is allocated will also be found here; as shown in the following accounts—

Dr. BUILDINGS *Cr.*

	£	s.	d.		£	s.	d.
Total Charges for Rents and Rates or Depreciation				Transfers to Shop Rates or General Works Rate Account . . .			

Dr.	PLANT						*Cr.*
	£	s.	d.		£	s.	d.
Total Charges for Depreciation and Repairs .				As in Buildings Account.			

Dr.	GENERAL WORKS RATE OR SHOP RATES ACCOUNT						*Cr.*
	£	s.	d.		£	s.	d.
Share of Cost in respect of—				Charges made to Work done at Rates in force			
Building . . .							
Plant . . .							
Power . .							
Heat and Light .							
Indirect Labour .							

Departmental Grouping of Expenses and Output.

An essential means of linking up the financial accounts with the commercial operations is to arrange the Trading and Profit and Loss Accounts on a departmental plan, that is so as to show the trading results in respect of different products. It is naturally of the greatest importance to ascertain which products are the most profitable. For this purpose the works cost of the goods manufactured must be used as the debit to the Trading and Profit and Loss Accounts in each department and the Administration, Distribution and Selling Expenses must be divided between the groups of products by careful analysis.

In some businesses a dissection into departments on these lines can be taken to an earlier stage and the operations in the factory can be separated in the same divisions, each distinct product having its manufacturing departments appropriated to it. In such cases the ascertaining of the cost of manufacture of each group of products is immensely simplified. The chief complication arises in respect of indirect expense charges on work which is done in one department for the benefit of another ; and it would appear reasonable that such indirect expense should be based upon the amount of time spent on such work at a rate of expense charged upon that time (or as a percentage upon the wages it represents) in proportion to the rate of expense in the department doing the work, or the

appropriate machine rates if particular classes of machines have been used.

In other cases it is impossible to appropriate the manufacturing departments to specific groups of output, the different articles making up the output, although dissimilar in their final stages, use and trading markets, being manufactured in common at different stages in all the departments of the factory; and where these circumstances apply it is undesirable as it is incorrect in principle to endeavour to load the commercial expense on to the manufacturing operations. Commercial operations require a different basis for their dissection and do not enter into the finished manufacturing cost of goods, which is the object of cost accounts applied to manufacturing. So that the arrangement of factory overhead must not be influenced by expenses connected with the commercial side of the business, the position being really that two functions are carried on—the one a manufacturing and the other a merchanting one. The manufacturing costs should arrive at the finished cost of the goods; this will be the cost on which the selling department make their calculations and this cost will be the price at which the goods come into stocktaking. The records in the Cost Ledger may be made up to show either the manufactured cost or the gross cost; but the application of overhead covering the commercial charges will be clearly an application of a charge which can be correctly made only against goods which are sold and not against those which remain on hand.

Costing Without Costs.

The primary object of maintaining cost records is to obtain the cost of each product, but the utility of cost records by no means ends when that has been achieved. It is from the use which is made of the cost records and the manner in which the incidental information obtained by the Cost Department is utilized that the whole of the Cost System justifies itself. Looked at from this point of view,

the compilation of Job Costs may be considerably curtailed when the cost records are sufficiently established to enable calculations to be made upon the basis of standard or normal cost, by means of the known cost of raw material, and the calculated cost of labour for performing the required operations ; the use of the costing records then becomes a criticism of shop efficiency by the comparison of output costs ; the scrutiny of costs of operations ; and investigation of non-effective or partly-effective assets, shown by such items as obsolete machinery, idle stocks, excessive amounts locked up in work-in-progress, etc. The efficiency of the cost system must be shown by the value it becomes to the management in showing up weak points by comparison of statistics relating to these factors with standards which it is able to obtain and can show to be attainable.

The frequency with which stocks of raw material are being turned over may be measured in terms of the number of months total withdrawals represented by the stock figure ; the value of the work-in-progress measured in terms of the number of months completed work ; the cost per unit of electricity in the power house, if producing its own current ; and the Idle Time records of machines compared with Overtime Records of other machines or departments will be similarly statistical records to which the Cost Department can turn its attention. These methods used in conjunction with a debit to departments of labour, shop expenses, and spoilt material against a credit for the value of the work they perform will enable the costing of completed work to be performed upon a basis of standard or normal costs and the check upon the shop efficiency will be much more speedily obtained than where the criticism of the foreman does not come about until the job is finished and the cost worked out in detail.

The valuation of work-in-progress is the one element which then presents difficulty and the difficulty is considerably increased, in fact the system may be said to be impossible where the work is non-standard. With

standard work valuation of work-in-progress can be assessed by taking a conservative estimate.

Retail Branch Shops.

Supplies to branches are usually charged on a Selling Price basis—

(1) To facilitate checking of stock ;

(2) To prevent difficulty in branches exchanging stocks ;

(3) Because it is not always desirable to disclose cost prices.

Returns from branches to Head Office then take the form of summaries of sales with cash remittances through local bank for the amount and Stock Account showing value (at Selling Price) of goods on hand.

Wages and Petty Expenses should be dealt with by Imprest covering the required amount.

Managers' commissions will be based on turnover.

For financial stocktakings the values of actual inventories must be agreed with stock figure and reduced to cost price.

Capital and Turnover.

The ratio of output to capital invested in a business may be used as a standard for comparisons at different dates—

(1) As regards capital laid out in permanent form.

(2) As regards circulating capital represented by stocks, work-in-progress, book debts, cash balances less outstanding trade liabilities.

(3) As regards total investment, which will include capital account, reserves, profit and loss balance, and fixed loans.

CHAPTER XVI

STATISTICAL PRESENTATION OF RESULTS

IT is a commonplace assertion that statistics can be made to prove anything, and anyone who has heard two debaters arguing opposite points of view from the same figures, one alleging that there is a concealed or undetermined element of error which entirely upsets the conclusions of his opponent, will readily grasp the enormous possibilities of miscalculation which may arise in the handling of numerical records.

It is clear that when figures are used for statistics—

(1) They must be accurate in themselves ; or

(2) The degree of accuracy must be known ;

(3) They must be prepared in appropriate classes.

When used for comparisons, the sets compared must exactly agree in composition.

The importance of the application of these principles in accounts lies in the settlement of tables of comparisons, whether of production, works expenses, wages in different departments, or in similar fields. The accounts of a business for one period lose much of their value if they cannot be compared with previous and following records. Such a comparison will be worse than useless if the accounts are not prepared on exactly similar lines year by year (or with known alterations of method or classification which are clearly shown). For instance, a book-keeper may classify catalogues in one year as printing, including such matters as company notices ; another year with advertising, where the item properly belongs ; or else with stationery, along with envelopes and india-rubbers. Indifference to correct classification may easily upset the validity of comparison in this way ; and exactly similar

difficulties may arise in all compilations of numerical records.

Another example may be mentioned in the booking of workmen's time, where some jobs are being done at piece rates and others at day wages. It is important that the time booked to the piece work should be stated correctly. If the employee is left to fill his time to his jobs at the end of the week, there is a natural tendency for him to insert such time as will ensure his earning bonus on the piece work, thus having a maximum amount of his time to be paid at day rate. Production statistics prepared from these records would then be misleading, because the actual production per hour on the piece work jobs would be over-stated, and that on the day work jobs under-stated. The introduction of time clocks to stamp the time when each job is commenced and ended will ensure accurate records all through.

A similar position arises in striking averages. A business man very readily assumes that if he is making 40 per cent gross profit in one department and 20 per cent in another, he will have an average gross profit of 30 per cent, and that his expenses at 25 per cent will leave him with a 5 per cent profit all round ; whereas if his first department with 40 per cent profit has only half the turnover of the other one at 20 per cent profit, his average gross profit is only 26·6 per cent and his net profit 1·6 per cent.

This illustration explains the distinction between an arithmetical average of numbers and a weighted average according to the quantities that the numbers represent.

The arithmetical average gives a true result when the factors are correctly comparable, e.g. the weights of 50 similar cases set out on an invoice totalling 1,400 lb. will average 28 lb. per case. If some of the cases are large cases and others half cases this result will not correctly interpret the circumstances. The number in each group must be obtained. Assuming there are 6 large cases and 44 half-cases :

Then $6 \times 1 = 6$
$44 \times \frac{1}{2} = 22$

28 cases $\quad \frac{1,400}{28} = 50$ lb. per case and 25 lb. per half-case.

This is an example of weighted average, the differentiating weight being applied to one of the factors.

Similarly, if in a factory the cost of warehousing and handling materials inclusive of storekeeping charges totals for 12 months to £2,100, and the weight of material handled amounts to 14,000 tons, the cost may be stated as 3s. per ton ; but if there are three classes of material, and the cost of handling is not proportionate to the weight but varies as say—

Class A—	*Class B*—	*Class C*—
2,000 tons with an expense of £10 per ton in proportion to £5 per ton of Class C.	5,000 tons with an expense of £8 per ton in proportion to £5 per ton of Class C.	7,000 tons with an expense of £5 per ton in proportion to £10 per ton of Class A, or £8 per ton of Class B.

then the cost of handling, etc., in each case should be stated as—

A	2,000 × 10 =	20
B	5,000 × 8 =	40
C	7,000 × 5 =	35
	14,000	95

$\frac{£2,100}{95 \times 1,000} = £\cdot 022105$

Class A—·022105 × 10 = £·22105, say, 4/6 per ton
,, *B*—·022105 × 8 = £·1768 ,, 3/6 ,,
,, *C*—·022105 × 5 = £·1105 ,, 2/3 ,,

The application of the principle is seen in detail in framing rates of expense for the shops or departments in a factory when the expense has to be distributed equitably between them, and the rates proportioned to the work done in each.

If for example the expense rates in six departments of a factory are respectively 7s. 6d., 4s., 6s., 2s., 4s. 3d., 1s. 9d., per hour, the overhead charged to the jobs will not be at the average rate of 4s. 3d. per hour as would appear by

taking the arithmetical average of these figures, but must be found by taking into account the number of hours in respect of which overhead has been charged; so that if the direct labour hours in the departments are respectively 10,000, 3,500, 15,000, 900, 10,000, and 2,000 the true result will be found by taking the weighted average and is seen to be nearly 5s. 6d. per hour; the same averages may be contrasted as percentages on wages amounting to 212 per cent and 275 per cent.

The average is also spoken of as an arithmetical mean, and a series of numbers at equal intervals represent an arithmetical series or progression, a feature of the series being that any two consecutive numbers differ by a common difference.

In a series of numbers where the ratio of each term to the next in the series is constant a geometrical progression occurs. It is illustrated in the accumulation of compound interest and other progressional increases, where the increment is in constant proportion. The value of £100 at 10 per cent,

EXAMPLE (1)—

in one year is $£100 \times \frac{110}{100}$

in two years it will be $\left(£100 \times \frac{110}{100}\right) \times \left(\frac{110}{100}\right)$ or $£100 \times \left(\frac{110}{100}\right)^2$

so that in ten years it will be $£100 \times \left(\frac{110}{100}\right)^{10}$

The increase occurs in geometrical progression and the values at the end of each year form a geometrical series. The total value at the end of the ten years is obtained most conveniently by the use of logarithms and is shown to be $100 \times 2{\cdot}594 = £259$ 8s. 0d.

(2) Similarly, if a sum of £100 is to be paid in five years in repayment of a present loan of £50 the yearly rate of compound interest will be the ratio of the geometrical series at yearly intervals. The series for the five years

is found by taking the fifth root of the ratio between the first and last terms of the series, that is $\sqrt[5]{\frac{100}{50}}$ which will give the ratio of the terms of the series; so that the rate per cent of the annual increase at compound interest is—

$$\sqrt[5]{\frac{100}{50}} \times 100 - 100$$
$$= 1{\cdot}148 \times 100 - 100$$
$$= 14{\cdot}8 \text{ per cent per annum.}$$

(3) A Sinking Fund is required to amount to £10,000 in 10 years, the annual instalment and interest being invested at 5 per cent per annum. If the yearly sum to be provided is represented by £X, then the summation of the geometrical progression shows that—

$$\pounds X \times \frac{\left(\left(\frac{105}{100}\right)^{10} - 1\right)}{\frac{105}{100} - 1} = \pounds 10{,}000$$

$$\pounds X \times \frac{(1{\cdot}05^{10} - 1)}{{\cdot}05} = \pounds 10{,}000$$

$$\pounds X \times (1{\cdot}629 - 1) = \pounds 10{,}000 \times {\cdot}05$$

$$\pounds X = \frac{\pounds 500}{{\cdot}629}$$

$$= \pounds 795 \text{ nearly}$$

(4) It is required to find the value of a Plant costing £100,000 in 20 years if 4 per cent per annum is adopted as a yearly rate of depreciation on the diminishing value.

In the series of yearly values £100,000 : £100,000 $\times \frac{96}{100}$: £100,000 $\times \left(\frac{96}{100}\right)^2$, the term at the end of the 20th year will be—

$$100{,}000 \times \left(\frac{96}{100}\right)^{20}$$
$$= 100{,}000 \times {\cdot}4426$$
$$= \pounds 44{,}260$$

The geometric mean of two quantities is found by taking

the square root of their product. The insertion of a series of geometric means between two quantities is shown in the above example (2) by the finding of the common ratio according to the number of terms required.

The geometric mean is always less than the arithmetical mean for the same numbers and so may be more conveniently adopted for contrasting tables of averages where the extremes are widely divergent.

Another form of variation in a series of statistical data is that of harmonic progression which occurs in the acceleration of velocity or regular variation of motion. It may be illustrated by an example of a motorist, who, in travelling a distance, covers the first part of the journey at 10 miles per hour, the second part at 20 miles per hour, the third part at 30 miles per hour, and the fourth part at 40 miles per hour. The average rate of travelling is not 25 miles per hour, but 19·2 miles. To find the harmonic mean of 10, 20, 30, 40, forming an arithmetical progression, the harmonic scale $\frac{1}{10}+\frac{1}{20}+\frac{1}{30}+\frac{1}{40}$ is used and $\frac{1}{4}$ of this total gives $\frac{1}{19{\cdot}2.}$ So that 19·2 is the harmonic mean of the series. Harmonic variation also occurs in vibrations of sound waves.

Other expressions which are used in connection with the tabulation of statistical data are—

(1) The Mode is the group in a series which contains the most numerous examples. It is not a specific example which is exactly determinable like an arithmetical average, but is the group as a whole into which the largest number of examples fall.

(2) The Median is again not the arithmetical average but is the example in the series which occurs at the centre point midway between the two extremes. It is thus different from the mode and to find it the centre point of the series must first be determined and then the

example occurring at that point must be found or estimated.

In a similar way to the determination of the Median, the Quartiles are placed at points midway between the Median and the extremes of the series and are similarly found: other terms in a series are referred to as variates. These points are particularly useful in dealing with large numbers such as statistics of population, employment, wages, etc.

In the tabulation of records dealing with the purely statistical side of a business, it is no less important to handle the figures so that they will present a correct view of affairs. The same applies to curves and diagrams when used for illustration purposes. These may give an exaggerated impression if faultily drawn in the setting out of the scale or in the methods adopted.

It is essential that the horizontal and vertical scales should be measured in equal gradations from the start to the finish of each scale, and for the purposes of comparison it is preferable to arrange the scales so that several series can be tabulated rather than to show independent diagrams, when different scales render comparison difficult. The records should progress across the diagram upwards and from left to right. Where the figures to be tabulated are not in respect of equal periods in each case, the periods over which the figures are tabulated must be proportioned accordingly so that an equal period of time (e.g. in the case of fluctuations of business or population, etc.) is represented by a similar space at any portion of the diagram.

Diagrams may be drawn to represent not only fluctuations between individual groups, but to show the cumulative effect of fluctuations as the period progresses; or the object of the diagram may be to show the trend of the statistics, and in that event a better presentation is made by averaging several periods to obtain each point on the diagram and a smoother curve results.

Another very common source of error is the readiness with which many business men accept "special tests" of work done as a safe basis for calculating results. So many factors enter into the problem in a case like the making of a special test of work in a factory, that even if frequently done, these will often be entirely unreliable owing to the prevalence, at the time, of necessarily unrepresentative conditions not applying to the factory as a whole; for example, in respect of such matters as time lost between jobs; time fixing or preparing machines; occasional faulty material and other similar causes. Thus, it is essential, in building up an approximation of the whole from a few selected factors, to have all the conditions fairly represented in the factors; any faults being magnified in proportion to the degree to which the conclusion is expanded.

Weekly Summary.

In most businesses a weekly summary is found useful showing—

(*a*) Sales in each department for the week and the corresponding week of the previous year;

(*b*) Total sales for the quarter to date, with similar comparisons of previous years;

(*c*) Statistics of *quantities* in detail of each product turned out, where these can be produced;

(*d*) Departmental cost and profit summaries, if obtainable, week by week;

(*e*) Statement of Sundry Book Debts, showing in an aggregate account the balance at the commencement of the week, sales debited for the week, cash and discounts and other credits for the week and aggregate balance;

(*f*) Similar statements of Bank Account and Sundry Creditors;

(*g*) Accruing liabilities.

WEEKLY SUMMARY

FOR WEEK ENDING_____

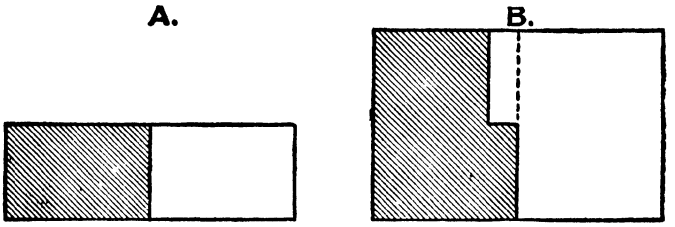
	Sales for Week.	Sales last Week.	Total Sales for Quarter.	Corresponding Week last Year.	Total for same Quarter last Year.	Output and Gross Profit from Cost Records. £	s.	d.
Net Sales—								
Dept. A =								
,, B =								
,, C =								
,, D =								
Increase =								
Decrease =								

Sales Ledger—		*Bank Account*—		*Purchase Ledger*—		Accounts for payment and Bills due.
Balance at commencement of week =		Balance forward =		Balance forward =		
Add Sales (Net) =		Deposits =		Purchases =		
Less Cash Received and Discounts =		Cheques Drawn =		Payments		
Total Book Debts =						

Use of Diagrams.

Diagrams should be made use of to emphasize—

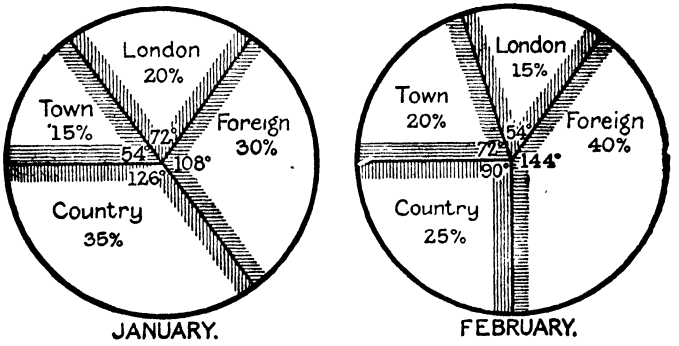
(1) Comparisons between groups; e.g. Areas proportioned to Population and shaded to show Trade done.



COMPARISONS OF TWO AREAS CANVASSED BY SALESMEN

A. Having Population, 50,000; Weekly Sales Value, £1,000; £2 per 100 Population.
B. Having Population, 100,000; Weekly Sales Value, £1,800; £1 16s. per 100 Population.

(2) The composition of a group or similar groups; e.g. Character and Proportion of Trade done in an Area comparing different Periods.

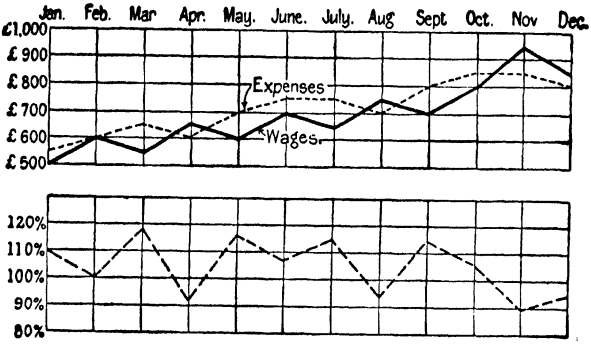


PER £100 SALES

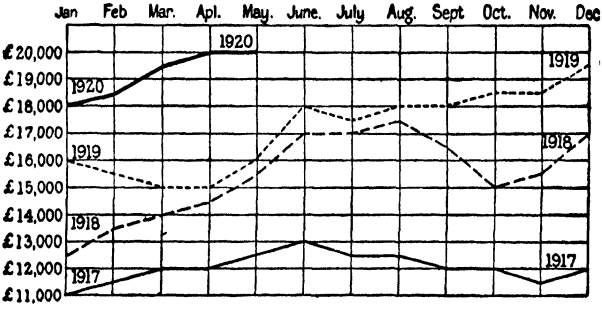
Diagram showing composition of Trade done in January and February.

(3) The variations in a series of similar records at successive dates; e.g. Wages and Expenses; with Expense fluctuations expressed as percentage on Wages.

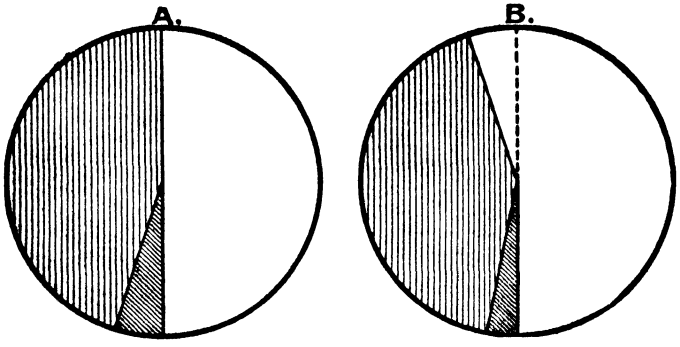
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
	£	£	£	£	£	£	£	£	£	£	£	£
Wages .	500	600	550	650	600	700	650	750	700	800	950	850
Expenses .	550	600	650	600	700	750	750	700	800	850	850	800
Percentage	110	100	118	92	116	107	115	93	114	106	89	94



(4) The variations between two or more series; e.g. Sales during different periods.



(5) Comparisons in three relations which can be combined geometrically, e.g. Sales per traveller per 1,000 population in different areas.



COMPARISON OF TWO AREAS CANVASSED BY SALESMEN TO SHOW SALES PER TRAVELLER PER 1,000 POPULATION

A. Population, 50,000; Sales, £1,000; Travellers, 10; Sales per Traveller, £100.

B. Population, 100,000; Sales, £1,800; Travellers, 15; Sales per Traveller, £120.

A. Sales per 1,000 Population, £20; Sales per Traveller per 1,000, £2.

B. Sales per 1,000 Population. £18; Sales per Traveller per 1,000, £1 4s.

CHAPTER XVII

EXAMINATION QUESTIONS

Institute of Chartered Accountants

(1) WHEN closing the accounts of a manufacturing business how should the value of " work-in-progress " be arrived at ? Briefly describe a type of business with which you are familiar and state how the value of this asset is ascertained. When the valuation has been made how would you require it to be dealt with in the accounts you are asked to audit ?

(2) From the following information prepare Pig Iron Production Account showing the cost per ton of each class of expenditure and of the pig iron produced—

Sundry Stores on hand 1st July, 1925—Coal, £4,720 ; Coke; £3,580 ; Limestone, £1,450 ; Ironstone, £3,930 ; Sundries, £2,700.
Purchased during the year—Coal, £21,880 ; Coke, £29,470 ; Limestone, £5,080 ; Ironstone, £18,690 ; Sundries, £7,810.
Sales of Slag, £10,000 , General Works Charges, £4,400 ; Wages, £17,600 ; Production of Pig Iron, 32,000 tons
Stocks on hand June, 1926—Coal, £3,800 ; Coke, £2,650 ; Limestone, £1,730 ; Ironstone, £3,420 , Sundries, £2,910.

(3) Show an account for distributing power, light, and heat expenses, indicating the items affecting this account, and discuss the basis of allocation (1) of the total charge over the departments, (2) of the departmental charges over the costing units.

(4) Draw up a system of Cost Accounts for a building contractor and show how they would be co-ordinated with the financial accounts of the business.

(5) You are asked to consider and report upon the costing system employed by a manufacturer of cycle accessories ; more particularly as to whether the interest upon capital and loans should be taken into account in arriving at costing results.

Report briefly upon the latter point.

(6) A pencil manufacturer makes two types of pencils "Black" and "Coloured." They undergo two processes, factory and finishing. Raw materials used in the factory and general expenses are apportioned in the ratio of output of each class; the output in 1926 was 24,000 gross Black and 8,400 gross Coloured; the actual cost of labour for each process is ascertained; "other charges" for each process are apportioned in the same ratio as labour for that process; finishing materials are apportioned in the ratio of finishing labour. From the following particulars prepare a statement of the cost per gross, in shillings and pence of each item and each process in the cost of manufacture; and the profit per gross if the selling prices are £1 and 19s. respectively.

	£
Factory Raw Materials, Opening Stock	3,680
,, ,, ,, Purchases	10,710
,, ,, ,, Closing Stock	4,940
,, Wages, Black	4,200
,, ,, Coloured	1,365
,, Charges	3,710
Finishing Wages, Black	2,000
,, ,, Coloured	560
,, Raw Materials, Opening Stock	720
,, ,, ,, Purchases	3,370
,, ,, ,, Closing Stock	890
,, Charges	1,920
General Expenses	3,645

(7) A, who commenced business on 1st July, 1925, as a piano manufacturer places before you the following information and asks you to prepare a statement showing the profit per piano sold (charging labour and material at actual cost, works overhead at 100 per cent on labour and office overhead at 25 per cent on works cost), and statement showing a reconciliation between the profit, as shown by the Cost Account and the profit as shown by the Profit and Loss Account for the year ended 30th June, 1926.

Two grades of pianos are manufactured and are known as No. 1 and No. 2. There were no pianos in stock or in course of manufacture on 30th June, 1926.

		£
Average Cost of Materials, per Piano	No. 1	10
,, ,, ,,	,, No. 2	8
,, ,, of Labour	,, No. 1	19
,, ,, ,,	,, No. 2	14
Finished Pianos Sold,	No. 1 . 118	
,, ,, ,,	No. 2 . 205	
Sale Price of Pianos,	No. 1	75
,, ,, ,,	No. 2	55
The Works Expenses were	. . . .	5,240
The Office Expenses were	. . . .	3,166

You are required to prepare the necessary statements, showing the actual profit for the year.

(8) The Paper Products Company, Ltd., owns—

A paper mill, all the output of which is sold to the factory at 10 per cent above mill cost price.

The factory which sells all its output to the selling department at 10 per cent above factory cost price.

The selling department.

From the following figures calculate (*a*) the factory cost of output, showing the proportion "paper" bears to "other goods, wages and charges"; (*b*) the profit made by the company in the year; allowing for (*c*) the reserve required to eliminate the unrealized profit on increase in stocks in the year, assuming that the selling department increase is in the same proportions as in (*a*).

	£
FACTORY—	
Opening Stock on Hand, Paper . . .	18,700
,, ,, ,, Other Goods . .	14,800
Paper Purchases from Mill	73,300
Other Goods, Wages, Charges, etc. . .	43,900
Closing Stocks on Hand, Paper . . .	24,200
,, ,, ,, Other Goods . .	13,500
SELLING DEPARTMENT—	
Opening Stocks on Hand	27,400
Sales	148,000
Wages, Charges, etc.	16,400
Closing Stocks on Hand	37,300

(9) What are the principles of Process Cost Accounts? Illustrate your answer by means of *pro forma* accounts of a manufacturing business to which Process Cost Accounts could apply with advantage.

(10) From the point of view of Cost Accounts discuss and compare the practice of paying wages—

(*a*) On the piece-work system ;

(*b*) On the day-work basis ;

(*c*) On the bonus or premium system.

(11) Submit a *pro forma* Manufacturing Account of any business with which you are familiar, drafted to facilitate the ascertainment of—

(*a*) Prime cost ;

(*b*) Factory cost ; and

(*c*) Office Overhead.

(12) Explain the circumstances in which the following alternative methods of allocating overhead are suitable—

1. Percentage on direct wages.
2. Rate per hour on direct time.
3. Rate per hour on machine time.
4. Rate per hour on machine time to cover machine expenses, and rate per hour on direct time for other expenses.
5. Rate per unit of output.
6. Rate per cent on prime cost.

(13) You are Auditor to a Limited Company which manufactures and repairs motor cycles. The directors have instructed you to extend your audit to the costing records.

Upon attending at the Stores Department you find—

(*a*) That invoices representing goods purchased are handed to the storekeeper when the goods arrive.

(*b*) That particulars of goods received and issued are entered by the storekeeper in a " Stores Book," no other record being kept.

(*c*) That stores are issued to foremen upon verbal request.

(*d*) That the storekeeper is allowed to order goods direct if under £10 in value.

(*e*) That stores " left over " from jobs are replaced in the store-room bins by the foreman concerned.

If you do not approve of the system of store keeping described above, make suggestions for its improvement.

(14) A Company carrying out large contracts, kept separate accounts for each Contract in its Contract Ledger. This Ledger showed the following expenditure in connection with Contract No. B497, as on 31st July, 1926 :

Materials Purchased	£47,952
,, from Store	8,674
Plant from other Contracts	12,520
,, Purchased	3,619
Wages	63,524
Direct Expenses	1,915
Proportion of Establishment Charges	7,619
	£145,823

The Contract, which was commenced on 1st February, 1926, was for £295,000, and cash had been received amounting to £110,950, which was the full amount certified, less 20 per cent retention money. The work was certified to 31st July, 1926, when it was half completed, and materials on the site were valued at £8,747.

A Contracting Plant Ledger was kept in which depreciation was dealt with monthly, the total amount of which was £1,419 in respect of Plant on Contract No. B497.

You are required to prepare an account showing the profit, if any, to date ; and to state what amount should, in your opinion, be taken into consideration in the Company's accounts for the year to 31st July, 1926.

(15) Prepare a Wagon Revenue Account for a concern, comprising a colliery and brickworks, which owns railway wagons, used—

(*a*) To carry coal from the colliery to customers.

(*b*) To carry bricks from the brickworks to customers.

(*c*) To carry coal from the colliery to the brickworks.

(*d*) To carry bricks from the brickworks to the colliery.

(16) A Limited Company owns and works deposits of clay and coal. The clay is used in the manufacture of clay ware and earthenware, and the coal required for firing

kilns is obtained from the Company's Colliery. Surplus coal is disposed of in trading.

It is important that the results of Colliery and Clayware Departments be distinguished.

Discuss the principles governing the fixing of the price of coal used in the Clayware Department.

(17) In return for a wayleave granted by B. Co., A. & Co., Ltd., which company pumps water (with an electrically driven pump) and generates electricity for its own requirements, agrees to supply the B. Co. with water and electricity at cost price, the cost to be certified by you as Auditor of A. & Co., Ltd.

The water and electricity are metered and you find—

1. That the cost of pumping, other than electricity consumed, amounted to £250.
2. That the cost of electricity, other than water consumed, amounted to £4,950.
3. That the water pumped had been distributed as follows: (*a*) To the B. Co., one-fifth ; (*b*) To the Electrical Works of A. & Co., Ltd., three-fifths ; (*c*) To other departments of A. & Co., Ltd., one-fifth.
4. That 500,000 units of electricity had been generated and used as follows: (*a*) By the B. Co., 100,000 units ; (*b*) By the Water Pump, 100,000 units ; (*c*) By the Electrical Works of A. & Co., Ltd., 100,000 units ; (*d*) By other departments of A. & Co., Ltd., 200,000 units.

Prepare accounts showing the cost of water and electricity respectively, and the charges to be made for each, to each consumer.

Society of Incorporated Accountants and Auditors

(18) Do you consider it advisable that there should be agreement between the financial and costing records of a business ? Give reasons for your answer, and explain what alterations would be necessary to the financial records of purchases and wages in order to effect agreement.

(19) You are required to select a manufactured article with which you are familiar, and—

1. To frame a cost sheet giving the details which enter into the cost of production.

2. To explain the basis upon which the overhead expenses have been apportioned.

3. To describe the audit you would conduct when checking the cost sheet.

(20) What steps should be taken to provide a continuous check on the Stores and the Storekeeper.

(21) How far, and in what manner, do standard costs become a factor in the management and control of a manufacturing company ?

(22) Works A and Works B are under one control, and manufacture one commodity. It is desired to ascertain the comparative cost of manufacture at each works. Describe the steps you would take in order to carry this out.

(23) A client who has four different manufacturing departments, A, B, C and D, containing 12, 10, 8 and 6 machines respectively, asks for your advice in assisting him to arrive at a basis of costing. The machines, though uniform in each department, differ in size and capacity.

From his last year's Trading Account you extract the following information—

	£
Productive Wages	20,000
Material Used	15,000
Expenses	15,000
	£50,000

The expenses consist of the following items—

Rent and Rates	2,500
Power	1,500
Light and Heat	250
Repairs and Renewals	750
Insurance	500
Interest on Capital	2,500
Depreciation	2,000
Salaries	2,000
Non-Productive Wages	1,000
General Expenses	1,500
Discounts	500

Your investigation shows that the first seven items of expense, amounting to £10,000, should be charged direct to the departments in the following proportions: A, 50 per cent; B, 25 per cent; C, 12½ per cent; D, 12½ per cent. The remaining four items, amounting to £5,000, should be treated as indirect expenses, and should be charged to the departments as follows: A, 35 per cent; B, 35 per cent; C, 15 per cent; D, 15 per cent.

The wages of the departments were: A, £7,000; B, £6,000; C, £4,000, D, £3,000; and the materials used in the departments were: A, £5,000; B, £5,000; C, £4,000; D, £1,000.

Find the total cost of production of each department and the hourly rate of expense of each machine, reckoning 44 hours per week and 50 working weeks to the year.

(24) Make a suggestion for dealing with the depreciation of a plant, which, costing £1,000, has an efficient life of ten years, and then has a scrap value of £200, and give arguments for and against the adoption of the various methods.

(25) What are the principal methods of estimating and distributing overhead expenses in costing accounts? To what special type of industry would each system be most appropriate?

(26) Devise stock keeping systems for the following concerns—

(*a*) A pianoforte dealer; (*c*) A brass founder; and
(*b*) A general draper; (*d*) A general merchant.

What do you know of continuous methods of calculating stock?

(27) Give draft of statistical information which should be kept by a large stores with, say, 100 departments; and for what reasons would you refer to such statistics for audit purposes?

(28) (*a*) What tests can be applied so as to ensure the accuracy of Cost Accounts?

(*b*) What steps would you take as Auditor to check

the accuracy of calculations arrived at through the costing accounts.

(29) Explain the procedure of continuous stocktaking and its advantages over an annual stocktaking.

(30) How would you satisfy yourself that the amounts appearing under the head of Materials and Stores allocated to "Works Repairs" and "Standing Orders" were substantially correct?

(31) (*a*) Write a careful account showing how wages are dealt with in costing systems, specially dealing with cases of varying efficiency and abnormally-employed labour, where some men are employed on piece-work and some on fixed wages. What part will the superintendence of labour play in your system of costing?

(*b*) State the methods you would apply to secure the proper allocation and charge of day and night piece work labour costs to articles of production.

(32) You are instructed to report on the accounts of a large bakery establishment for the purpose of ascertaining the cost of production of bread. With a view to the comparison of results you are instructed to base your calculations on the cost of production of a quartern (4 lb.) loaf. You find that your clients do not make quartern loaves but only 1 lb. and 2 lb. loaves in the proportions of 3 to 2, and that the actual weight of dough required to make a 1 lb. loaf is 1·25 lb., and a 4 lb. loaf 4·50 lb. What recommendations do you make in order to render your report of value for statistical comparison? In your answer you may assume that the total weight of the dough produced is 1,521,000 lb.

(33) Draw up a *pro forma* trading account suitable for any *one* of the following businesses, namely: (*a*) woollen manufacturer, (*b*) printer, (*c*) steel manufacturer, marshalling the items in such a manner as to adapt them for the purpose of ascertaining: (i) prime cost, (ii) factory oncost or overhead charges, (iii) administrative charges, and (iv) selling expenses.

(34) In many cases it is difficult to locate accurately cost of production to definite articles or products, as for example: (*a*) Production from a slate or stone quarry, where various grades and qualities of slates or stones are obtained from one mass or block, the grades being sold at varying rates according to the size and quality; (*b*) Gas, coke, tar, and ammoniacal liquor from carbonized coal. State what particulars would guide you in allocating the cost of production in the two cases named. Should by-products be charged with any portion of the material costs or costs of production?

(35) A biscuit manufacturing firm only estimates the cost of production of the articles manufactured by it, and does not attempt in any way to verify their accuracy by balancing the estimated costs of production of all articles with its general trading accounts. You are requested to examine a detailed cost sheet of this firm of a specified biscuit and to state whether in your opinion the estimated costs are approximately accurate or otherwise. Point out the methods you would adopt in verifying the costs submitted, and the basis on which you would suggest the " factory overhead " should be applied.

(36) How would you ascertain whether the total oncost or overhead factory charges of a factory for a given period, had been properly and fully absorbed in the costs of production for that period? Would you object—as an auditor—to the addition of a percentage of factory overhead to the work-in-progress at date of making up the annual accounts?

London Association of Accountants

(37) What is the difference between—

1. Prime Cost;
2. Cost of Production?

(38) Define—

1. Output or Single Cost Accounts;
2. Working Cost Accounts;
3. Departmental Cost Accounts;

4. Multiple Cost Accounts;
5. Process Cost Accounts.

(39) The following is the Trading Account of a manufacturer from which you are desired to ascertain (*a*) the cost of materials used; (*b*) the value of the output of manufactured goods.

Dr. TRADING ACCOUNT *Cr.*

	£	£		£	£
To Stock—			By Sales . . .		52,500
Finished Goods	5,000		„ Stock—		
Raw Material . .	1,500		Finished Goods .	4,375	
		6,500	Raw Materials .	1,750	
„ Purchases . .		15,000			6,125
„ Wages . . .		25,000			
„ Carriage . . .		1,250			
„ Gross Profit .		10,875			
		£58,625			£58,625

(40) The following account appears in the Impersonal Ledger of a firm of contractors. What is the object of this account, and what does it represent?

COST BOOK ACCOUNT

1926.		£	1926.		£
Jan. 1	To Balance .	2,000	Dec. 31	By Contracts and Charges . .	35,000
Dec. 31	„ Materials from Stock . . .	16,000		„ Materials returned to Stock . .	1,400
	„ Wages . . .	12,000		„ Balance carried down . . .	2,600
	„ Sundries — Cash Payments .	100			
	„ Profit and Loss Account . .	8,900			
		£39,000			£39,000

(41) Into how many classes may Factory Cost Accounts be divided? State the objects of each class.

(42) (*a*) Into how many classes may indirect expenses—or overhead—be divided?

(*b*) Give examples of expenditure of each class.

(*c*) What are the two principal methods by which overhead may be allocated over various contracts?

(43) (*a*) From the following details taken from the books of an iron company, prepare an account showing the cost of the pig iron manufactured during the year ended 31st December, 1926.

	Stock at 1st Jan., 1926.	*Stock at 31st Dec., 1926.*
	£	£
Limestone	300	135
Coal and Coke	2,400	1,700
Iron Ore	1,400	1,690
Purchases—		
Limestone	4,000	
Coal and Coke	39,000	
Iron Ore	17,000	
Wages	16,000	
Carriage Inwards	2,100	
Repairs, Renewals, and Depreciation	4,200	
Output	50,000 tons	

(*b*) What was the gross profit on sales of pig iron during the year? The stock at 1st January was £40,000 and at 31st December, £27,500, the sales being £135,000.

(44) The following particulars relate to the year ended 30th September, 1926, and are from the books of a malleable ironfounder, making only small castings. The sales amounted to £28,000.

	£
Stock of Finished and Partly Finished Goods at 1st October, 1925	618
Stock of Finished Goods and Partly Finished Goods at 30th September, 1926	480
The Net Manufacturing Cost amounted to	19,700
Finishing Goods & Warehouse Salaries and Packing Materials amounted to	1,418
The total of the Distribution and General Expenses was	2,660

(*a*) State the gross profit and the percentage to sales;

(*b*) State the net profit and the percentage to sales;

(*c*) According to these figures what percentage should be added to manufacturing cost to cover warehouse overhead?

(*d*) And what percentage should be added to that result to cover general and distribution expenses?

Institute of Cost and Works Accountants

(45) Give your views as to the respective merits of a perpetual inventory system and physical stocktaking, and state when and for what purposes either of these can be relied upon without resorting to the other. Under what conditions would you consider an interim physical stocktaking necessary?

(46) How would you deal with the cost of patterns in your cost accounts?

(47) Describe a system of control and records for use in connection with coal or slack in an industry which consumes it in large quantities.

(48) Formulate a system in outline by means of which the cost of production of by-products could be ascertained.

(49) From the following figures draft a form of Weekly Cost Sheet for a foundry—

Production 330 cwts. good castings.

	£	s.	d.
Sand	3	–	–
Limestone	57	–	–
Sundry Stores	15	–	–
Coal	94	4	–
Pig Iron	276	–	–
Scrap	51	–	–
Wages Direct	120	–	–
Rent and Rates	47	8	–
Other Expenses	17	8	–
Wages Indirect—			
Coremakers	24	–	–
Foreman	30	–	–
Dressers	30	–	–
Other Wages	27	–	–
	£792	–	–

(50) A firm of engineers are desirous of tendering for the erection of a suspension bridge. From the following estimated figures prepare a statement showing the total cost, and also the sum which they can quote in order to obtain a net profit of approximately 9 per cent. Total cost of materials required £5,000, labour £3 per ton on 600 tons, carriage freight, and insurance, 600 tons at 25s. per ton, erection £2 5s. per ton, use of erector's plant and tools, £200, travelling expenses £450. Works expenses 50 per cent on labour, establishment and general expenses 20 per cent on labour.

(51) Describe a method for controlling minimum and maximum stocks of raw materials.

(52) Describe a method that will enable you to automatically ascertain, at the end of each month, the values

of "materials and work-in-progress." Show the accounts used and make the final entries necessary for balance sheet purposes.

(53) The following statement of expenses is taken from the books of a manufacturing company. Divide the Establishment Expenses under the following headings, stating the method upon which you would base your rates and reasons for so doing—

(*a*) Machine Rate (*c*) Sales and Distribution
(*b*) General Works (*d*) Administrative and Financial

Rent, Rates, and Taxes	£1,000
Repairs and Maintenance (Plant and Machinery)	596
,, ,, ,, (Buildings)	482
Fuel	540
Gas and Water	195
Electrical Power	811
Materials used	102,418
Maintenance of Patterns	618
Wages	48,017
General Shop Supplies	311
Interest on Loans	281
Storekeeping	225
Bad Debts	176
Works Management	323
Depreciation (Buildings)	1,640
Foremen, Labourers, Timekeeping, etc.	1,418
Depreciation (Plant and Machinery)	3,000
Carriage Inwards	257
,, Outwards	530
Commissions	195
Drawing Office and Supplies	786
Travelling Expenses	462
Designing and Estimating	578
General Expenses	430
Management and Secretarial	950
Advertising and Literature	250
General Office	776
Stationery	87
Rates, Taxes, and Insurance (Office Property)	430
Branch Expenses	1,278
Sales	173,510
Productive Hours worked	397,500 hours

VALUE OF WORK IN PROGRESS—

At Commencement of Period.			*At End of Period.*		
Labour.	Mtls.	Estab't Exps.	Labour.	Mtls.	Estab't Exps.
£14,701	£11,068	£13,408	£13,041	£9,017	£12,101

(54) Explain very fully the following—

(*a*) Should Interest on the Capital Outlay in Plant and Machinery be included in Establishment Expenses?

(*b*) If so, under which heading (in question 53) would you include this item and why? If not, give your reasons.

(55) Give details of a method of arriving at a "Machine Rate" and in particular how you would incorporate the undermentioned items of expenditure in such rate—

(*a*) Depreciation of Buildings
(*b*) Cost of Power
(*c*) Small Tools
(*d*) Shop Supervision Wages

also state how you would apply the rate so arrived at, to your cost accounts.

(56) On completion of a Reconciliation Statement of Factory Expenses and Overhead at the end of the Accounting Period it is found that the total charges for Factory Expenses or Overhead have not been completely absorbed in the Cost Accounts. State how you would deal with the balance in question.

(57) In the majority of factories where small parts, such as bolts, nuts, screws, etc., are consumed in great quantities over a period of, say, 12 months, also certain standard raw materials are usually charged in "costs" by weight, the purchase price for these items will vary greatly during this long period. Describe any special method you consider will be necessary to ascertain and regulate the price at which the above items should be charged in your cost accounts in order to obviate any great difference when comparing the total value of stocks on hand as against stores purchased and issued.

(58) In a factory working departmentally and manufacturing its own tools (and using same) would you consider that to make tools is productive or otherwise? State reason and point of view.

(59) State how you would deal with each of the following items in your cost accounts and which items you would—

(*a*) Include in your Establishment Expenses or "Overhead."

(*b*) Charge to Capital.

(*c*) Charge to Revenue.

Give reasons for your answers.

1. Expenses of Welfare Department.
2. Employers' Liability Insurance.
3. Experimental Expenses.
4. Carriage inwards.
5. Renewals to loose plant and tools.
6. Debenture Redemption Fund.
7. Patents Expenses.
8. Waiting and Idle Time.
9. Share Transfer Fees.
10. Fire Insurance Premiums.
11. Bad Debts and Bad Debts Reserve.
12. Insurance—Old Age Pensions.

(60) Draft a final cost summary sheet for use in connection with the management of mechanically propelled transport vehicles, and explain how you would obtain all the information required therefor. What checks would you employ to prevent wrong information being returned?

(61) How would you proceed to provide for the continuous measurement of labour efficiency in a factory with which you are acquainted?

(62) In the generation of electrical energy there are three distinct processes: (*a*) Coal transport and handling; (*b*) Steam generation; and (*c*) Utilization of steam in the production of the electrical energy.

Part of the electrical energy which is finally produced is consumed (in unequal and varying amounts) in each of these three processes, so that the ultimate net output is the total amount generated less that used in the three processes. State the method you would adopt in order to show the true cost of each process having regard to these facts. Prove your answer with assumed figures.

(63) At the end of the financial year there is a discrepancy

of 11 per cent between your Raw Material Control Account balance and the totals (proved correct as far as addition is concerned) of the balances of your Material Ledger Cards. You are instructed to investigate the accounts. State how you would proceed and enumerate all the possible causes of the discrepancy.

(64) In some cases workers are engaged upon an operation in which they deal with various types of product, it not being practicable to determine the actual time spent in connection with each. How would you proceed to obtain reliable labour costs in such a case ?

(65) How would you treat overtime pay in arriving at the labour cost of a job or article ?

(66) Owing to trade conditions, a department of a factory is working to 40 per cent of its normal capacity. State how you would propose to deal with the standing expenses of that department when costing its products.

(67) In most industries where order costing is applied, there is to be found one class of operation or one department in which the methods of allocation of time and material as applied to the rest of the factory cannot be employed. Examples are the electro-plating department of a general engineering works, the ammonia stove of a waterproof garment factory, the steaming chamber of a dye house, the baking oven of a biscuit factory. Describe how you would calculate and distribute the cost of running one of these departments, or of a similar department, of which you have first-hand knowledge. Criticize the value of your method.

(68) The labour employed on certain operations in engineering shops, e.g. welding, hardening, enamelling, etc., is often of such small dimensions as to make it impracticable to charge it direct to Job Orders. What is your recommendation for dealing with such charges ?

(69) Having determined maximum and minimum stocks in a large store, what is the machinery which should be used to ensure its automatic operation ?

(70) It is decided to distribute works overhead by means of two separate rates, one on direct labour and one on direct materials. In arriving at these rates state how you would allocate the various Overhead expenses between these two sections.

(71) Do you consider it essential that the whole of the general or overhead expenses should be absorbed in production cost regardless of the volume of production during the period concerned ?

(72) A firm has two plants manufacturing the same product, and decides to close down one of these plants and transfer the production to the other. Outline the features you would expect to make in a report on the probable saving in cost of production consequent on the proposed step.

(73) A firm produces toy engines and motor-cars which are stamped out of tin plates, assembled and sometimes painted, and desires to ascertain its profit and loss to date on each running contract. As it is their busy season, they cannot stop work for a physical stocktaking. Is it possible to obtain the required information ? If so, explain exactly how they should proceed to get it.

(74) A factory with seven departments puts in hand a large internal repair job, utilizing most of the departments' labour, and finally the job is fixed in one of the departments with its own labour. How should this be dealt with in the accounts ?

(75) Assuming a grant of £10,000 to have been made for new constructions to be carried out by a firm's own staff ; that on completion the cost was found to be £12,000, due in part to the lack of proper equipment, and that the work could have been contracted for outside at £8,000. What, in your opinion is the figure which should be added to the Capital Account ?

APPENDIX

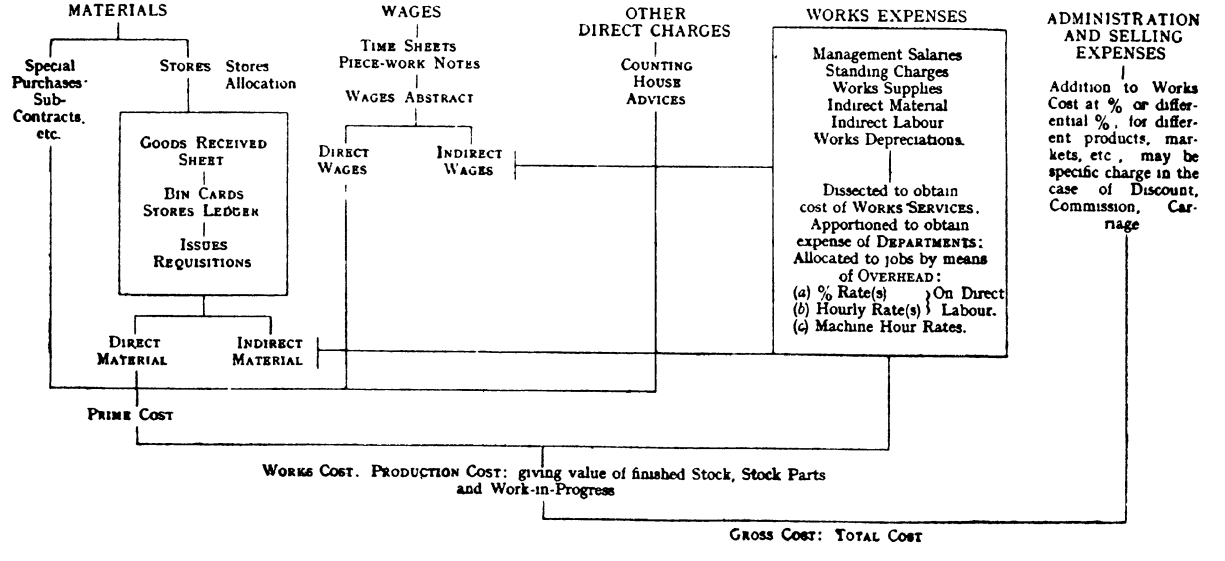
MODEL FORMS

16—(B.1765) 24 pp.

PRACTICAL COSTING ROUTINE

(Suitable for an Engineering Works)

Costs are obtained of every Part and Summaries of Costs for every Machine Works orders are issued for batches of parts, for complete machines built up from stock parts and special fittings and for repair work Expenses are recorded under Factory Expense Standing Order Numbers against the shop responsible



QUANTITY SHEET

Purchaser.....*Messrs. Brown & Co.* .....
Description of Order....*One* 20,500 *K. V. A.* (18,000 *K.W.*) *Turbo Alternator*
Delivery Date....*20th Dec.*, 19—.....

Pro. No.....*PA 7A*.....
Quantity Sheet No.....12.....
Data Sheet No. .....
Date of Issue....*7th May*, 19—....

Drawing Number.	Part.	Number.		Pro. No., Description and Remarks.	Mat'l.	Test.	Routing.	Supplied from.	Plan Compl. Dates.			Date Issued.
		Set.	Total.						Dept.	Start.	Finish.	
L. 1110/103 *A*	7	12	12	*Field Coils. Req'd* 12 *lengths, each* 360 *ft. long, of soft double annealed H.C. Copper Strip,* 1.50 *in.* × .220 *in. bare, with semi-circular edges.*	*Cpr.*		23	*Req.* 326				
*L.*1180 *M* 102 *A*	3	60	60	*Springs. Req'd* 60 *ft. of* ¾ *in.* × .045 *in. Spring, Phosphor Bronze.*	*Ph. B.*		7	*Stock*				
P. 2011, *M.* 15	—	2	4	*Caps (Pinion End), Patt.* 6 *M*, 39 *C.*	*C.S.*		4	*Req.* 326				

EXTRACT FROM MATERIAL SPECIFICATION (QUANTITY SHEET)

REQUISITION

Purchaser.....*Messrs. Brown & Co*.....
Description of Order....*One* 20,500 *K. V. A.* (18,000 *K.W.*) *Turbo Alternator*
Delivery Date Required....15*th June*, 19—.....

P. O. No. .....*PA 7A*.....
Requisition No. .....326.....
Date of Issue to Order Dept.....14/5/—.....

Drawing Number.	Part No.	Number. Set.	Number. Total.	Mat'l.	Description and Remarks.	For Dept.	Ordered from.	Order No.	Date of Order.	Promised Delivery Date.
·	7	12	12	*C'pr.*	12 *lengths each* 360 *feet long, of soft double annealed H.C. Copper Strip,* 1.50 *in.* × .220 *in. bare, with semi-circular edges.*	23	*Smith & Co.*	*P.E.* 1493	16/5/—	*Start* 1*st June and complete by* 10*th June.*
P. 2011, *M.* 15	—	2	4	*C.S.*	*Caps* (*Pinion End*), *Patt.* 6 *M.*, 39 *C.*	4	*Davies & Co.*	*P.E.* 1497	16/5/—	*Four weeks after receipt of order.*

Signed____*F. W.* _____

PURCHASE REQUISITION
(Material special to order)

GOODS RECEIVED ON ..... *18th July*, 19— ..... No. ... 1793 .....

From ..... *Messrs. Davies & Co.* ..... Per .... *L.M.S. Goods* .....

Order No ..... *PE* 1497 ..... Pro. No ..... *PA 7A* .....

Drawing.	Part.	Pattern.	DESCRIPTION.	Qty.	Weight. T.	C.	Q.	lbs.	Rate.	Value. £	s.	d.
P.2011, M.15	—	6 *M.*, 39 *C.*	*Cast Steel Pinion End Caps.*	4			1	12	56/- *cwt.*	£1	-	-

Received by ..... *T. R.* ..... Inspected by ..... *A. B.* ..... Received in Shop ..... *W. W.* .....

MATERIAL (SPECIAL) RECEIVED IN SHOP

(Similar advice (differently tinted paper) used for material received in Stores)

GOODS RETURNED ON ...20*th July*, 19— ..... No. .....184.....

To.....*Messrs. Davies & Co*..... Per .....*L.M.S. Goods*.....

Order No.....*PE* 1497 ..... Pro. No. .....*PA 7A*.....

Drawing.	Part.	Pattern.	DESCRIPTION.	Qty.	Weight. T.	C.	Q.	lbs.	Rate.	Value. £	
P. 2011, *M.* 15	—	6 *M.*, 39 *C.*	*Defective Cast Steel Pinion End Cap.*	1				10	56/- *cwt.*	£	5

Received at Despatch_____*F. E.*_____ Reason for Rejection_____*Wrong Size*_____

MATERIAL RETURNED TO SUPPLIER

PURCHASE REQUISITION

for.....*Stock*..... Date....*7th May*, 19—.....

Account No..... .....*C. I/403*.....

Quantity.	Description.	Purchase Order.	Supplier.	Purchase Notes.
100 *feet*	½ *in.* × .045 *in. Spring Phosphor Bronze*	*P. E.* 1287	*Dunn & Co.*	

Submitted by _____*R. F.*_____

Approved by_____*J. K.*_____

PURCHASE REQUISITION
(Stock Material)

STOCK MATERIAL REQUISITIONS

Pro. No. .....*PA 7A*.....

Contract.....*Messrs. Brown & Co.*..... Date.....*27th June*, 19—.....

Drawing No.	Part.	Q. S. No.	Quantity.	Description.	Stores Folio.	T.	C.	Q.	lbs.	Rate.	£	s.	d.
L 1180, *M.102A*	3	12	60 *feet*	¼ *in.* × .045 *in. Spring Phosphor Bronze*	7				7½	1/6 *lb.*		11	3

Foreman	Shop	Approved	Issued by	Posted by	Date	Entered by	Entered on Costs by
B. B.	7	*K.*	*E. E.*	*T. R.*	28/6/2–	*M.*	*W. W.*

STORES REQUISITION

STOCK MATERIAL RETURNS

Pro. No. ..... *PA 7A* .....

Contract..... *Messrs. Brown & Co.* ..... Date..... *18th July*, 19—.....

Drawing No.	Part.	Q. S. No.	Quantity.	Description.	Stores Folio.	T.	C.	Q.	lbs.	Rate.	£	s.	d.
L. 1180, *M.* 102 *A*		12	4 *feet*	¾ *in.* × .045 *in. Spring Phosphor Bronze.*	7				¼	1/6 *lb.*			9

Foreman	Shop.	Approved.	Received by	Posted by	Date.	Entered by	Entered on Costs by
B. B.	7	*K.*	*E. E.*	*T. R.*	19/7/—	*M.*	*W. W*

MATERIAL RETURNED TO STORES

HOLD [redacted] HERE

Check No. 278 Week No. 1/4/...

Name J. Simpson.

Day Work Job Card.

Part Name End Cover Holes		Pro. No. P.K. 23 A							
Operation Turn Bore Face & Trim		Drawing and Part No. P.905/019A 11							
		Patt. No.							
Grade 5'	Matl.	Q.S. No. 68.							
		Cross Ref. with							
Ordinary Time	Overtime	Extra Time	Rate		£	s	d		
17	1	3½	5½.		1	12	9		
A.C.W. Foreman			L.S. Inspector						

DAY WORK TIME CARD—TIME CLOCK RECORD ON BACK

This Side Towards You.

Don't Use Force.

16A—(B.1765)

HOLD HERE

Check No. 278 Week No. 44

Name J. Simpson.

HOURS			Pro. No. PA 7A.							
Forward	This Week	Taken or Forward	Drawing and Part No	L1134M102 3						
12	8	20	Patt. No.							
Part Name Slip rings.			Q.S. No.	7						
Operation Turn & Bore.			Cross Ref. with							
Grade S.	Matl.									

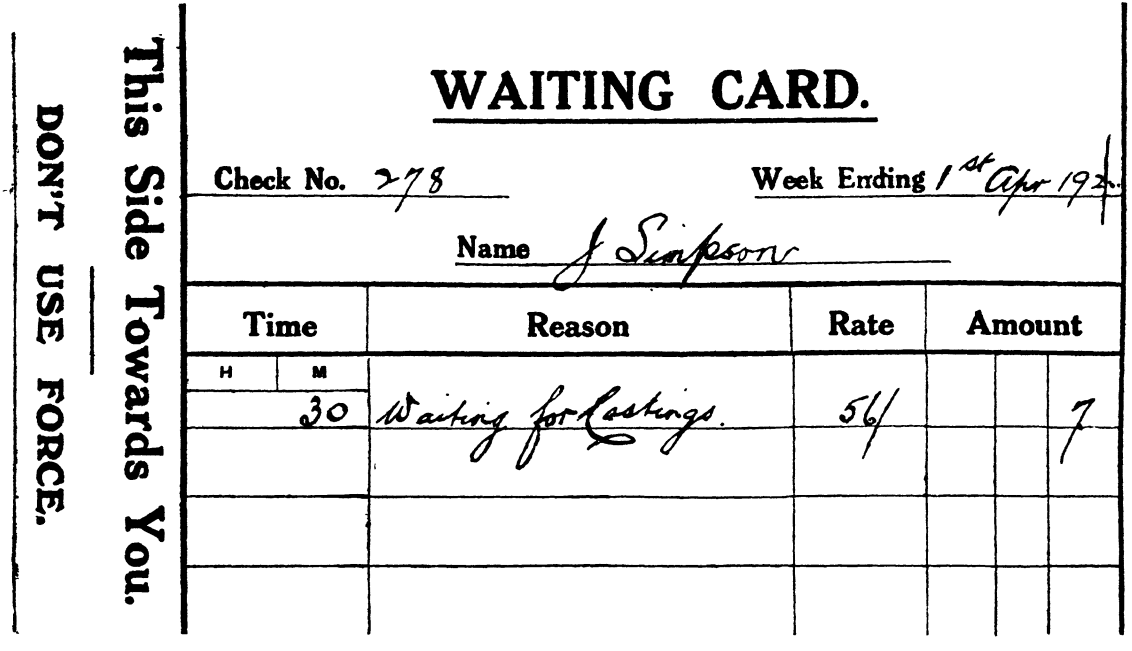
Quantity		Rejected		Price 5/7 Per	1	2	4
Issued	Returned Correct	To Pay	No Pay	Preparing 15 min.			4
5	4		1		1	2	8
				Balance to Draw		10	11
				Balance Overdrawn			

Price Passed by	Job Completed	Work Passed	COST OFFICE ONLY		
Foreman	Foreman	ID No 7. Inspector			

PIECE-WORK TIME CARD—TIME CLOCK RECORD ON BACK.

THIS SIDE TOWARDS YOU.

DON'T USE FORCE.



WAITING CARD.

Check No. 278

Week Ending 1st Apr 192

Name J Simpson

Time H	Time M	Reason	Rate	Amount		
	30	Waiting for Castings.	5/			7

This Side Towards You.

DON'T USE FORCE.

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HOLD HERE

TIME CARD: WAITING TIME—TIME CLOCK RECORD ON BACK

No. 278

Name J Simpson

Week ending 8th April 19..

			TIME		
			Ord	Over	Extra
7 30	W	2 AP	8½		
12 55	W	2 AP			
7 28	TH	3 AP	8½		
12 59	TH	3 AP			
7 31	F	4 AP	8½		
1 00	F	4 AP			
7 23	SA	5 AP	4½		
11 59	SA	5 AP			
7 30	M	7 AP	8½	5½	2¾
12 58	M	7 AP			
10 59	M	7 AP			
7 27	Tu	8 AP	8½	3½	1¾
1 00	Tu	8 AP			
9 00	Tu	8 AP			

RATE	56/-	TOTAL	47	9	4½
	56 Hours	Gross Wages	3	6	9
Bonus			.	11	11
Overtime	4½		.	5	4
Balance			4	4	0
Deductions					
Insurance				1	2
Club					4
Infirmary					2
Dr. Barnado's					1
NET WAGES			4	2	3

WEEKLY TIME CARD

WAGES SHEET

Check No.	Rate.	Name.	Hours.		Employers' Insurance.		Day Work	Piece Work	Deductions.					Gross.	Nett.
			Ordinary.	Over.	H.	U.			Club.	Dr. B. Home.	Workers' Insurance. H.	Workers' Insurance. U.	Infirmary.		
	£ s. d.				d.	d.	£ s. d.	£ s. d.			d.	d.	d.	£ s. d.	£ s. d.
276	2 16 –	*Brown*	47	17	5	10	3 16 3	—	2	1	5	9	2	3 16 3	3 14 8
277	3 – 6	*Jones*	47½		5	10	5 10	3 – 10	2	1	5	9	2	3 6 8	3 5 1
278	2 16 –	*Simpson*	47	13½	5	10		4 4 –	4	1	5	9	2	4 4 –	4 2 3

BURROUGHS PAY-ROLL MACHINE SHEET

DEVELOPMENT

Date.....19*th Dec.*, 19

(*a*) **Drawings** (*b*) **Patterns** (*c*) **Tools**

Section.....*Frequency Changer Set*, 9375 *K. V. A.*.....Dev. Pro. No. .....*D. A.* 5.....

Job.....*W. J. Robinson & Co*.....

a, *b* or *c*.	Short Description.	Estimate.			
		Materials.	Wages.	Charges.	Total.
a	*Drawings*	—	£100	£75	£175
b	*Patterns*	£50	£100	£100	£250
c	*Tools*	£150	£300	£300	£750
					£1,175

Form to be returned to Cost Dept. as soon as WORK COMPLETED.

Date completed_____19___

Submitted by_____*J. B.*_____

Dept. Supt._____*W. C.*_____

Works Manager_____*R. K.*_____

Approved.

WORKS EXPENSE AUTHORIZATION—DEVELOPMENT

CAPITAL

Date.....31*st* *March*.....19—

Section.....*Controller*..... Shop.....15..... Pro. No. .....5109/3.....

Job.....*Supply and Installing of one Grinding Machine*.....

Estimate.			Materials Required.			Purchases Required.	
£	s.	d.	Quantity.	Description.	If in Stock.	Firm.	Order.
370	–	–	*One*	*Grinding Machine, to be in accordance with quotation herewith*	*No*	*Messrs. James & Co., London*	

253

Labour.							
£	s.	d.	By Dept.	Est. by.	Date Finished.	Foreman.	
10	–	–	*No. 10 Yard*	*R. N.*			Dept. Manager . . ____*C. N.*____
4	10	–	*No. 1 Main Bays*	*A. M.*			Works Manager . . ____*R. R.*____
							Managing Director . _____
							Date Completed and Pro. No. withdrawn . _____
							Work approved . . _____

NO WORK MUST BE DONE UNTIL SIGNED FORMS ARE DELIVERED

WORKS EXPENSE AUTHORIZATION—PLANT

SPECIAL TOOLS

Date.....18*th June* .....19—

Section.....*Main Bays*..... Shop....*No. 1*..... W.D.O.Pro. No....*D.R. 2C/99*....

Job....*Drilling Jig for Brush Holder Holes in D.R. 93 Motor Frame. Drg. P.I.W. 70, M. 222*.....

Estimate. £	s.	d.	Quantity.	Description.	If in Stock.
			1	*Item* 1 *M.S. Plate*, 23½ *in.* × 15½ *in.* × ⅝ *in.*	*Yes*
1	–	–	1	„ 2 *C.I. Patt. No. P.I.W.* 70 *M* 222/2	„
			1	„ 3 *M.S.* 6½ *in.* × 1½ *in.* × — *in.*	„
			1	„ 4 *M.S.* 3½ *in.* × 1½ *in.* × — *in.*	„
			1	„ 5 *M.S.* 3 *in.* × 1½ *in. dia.*	„

Materials Required.

Purchases Required.

Firm.	Order.

Labour.

£	s.	d.	By Dept.	Est. by	Date Finished.	Foreman.
1	10	–	No. 6 *Tool*	*M. M.*		
	7	6	*No.* 20 *Pattern*	*W. A.*		
	5	–	*No. 3 Die*	*E. N.*		

Submitted by	*S. M.*
Dept. Manager	*C. N.*
Works Manager	*R. R.*
Date Completed and Pro. No. withdrawn	
Work approved	

NO WORK MUST BE DONE UNTIL SIGNED FORMS ARE DELIVERED

WORKS EXPENSE AUTHORIZATION—TOOLS

REPAIRS (Over £5)

Date ..... *1st March* ..... 19—

Section ..... *Pattern Shop* ..... Shop. . .. 20 ..... Pro. No. ..... 3020/6 .....

Job ..... *Repairs to Box Shop damaged by Works Crane* .....

Estimate. £	s.	d.	Materials Required. Quantity.	Description.	If in Stock.	Purchases Required. Firm	Order.
	3	–		*Iron Clips, Bolts, etc.*	*Yes*		
	14	–		*Wood as necessary*	,,		
	5	–		*Electrical Material*	,,		

Labour.

£	s.	d.	By Dept.	Est. by	Date Finished.	Foreman.
1	5	–	*No. 20 Pattern*	*W. A.*		
	5	–	*No. 3 Die*	*E. N.*		
3	12	–	*No. 18 Electrical Maintenance*	*R. O.*		

Submitted by . . ____*L. W.*_____

Dept. Manager . . ___*J. M.*_____

Works Manager . . _____*R. R.*_____

Date Completed and Pro No. withdrawn . _____

Work approved . _____

NO WORK MUST BE DONE UNTIL SIGNED FORMS ARE DELIVERED

WORKS EXPENSE AUTHORIZATION—REPAIRS

Survey Dates					Order Point	30′	Description *Phosphor*
Signed					Order Qty.	100′	

Appropriations.			Ordered.				Receipts.			
Pro.	Q.S.	Qty.	Date.	From.	O. No.	Qty.	Date.	From.	O. No.	Qty.
PA 7A	12	60′ 0	7/5/2 —	*Dunn & Co.*	*PE* 1287	100′ 0	17/5/—	*Dunn & Co.*	*PE* 1287	100′ 12 lbs
							18/7/—	*Cr. PA 7A*		

(Showing Purchases and Allocations,

LEDGER

Bronze, ⅛ in. × .045 | Stores No.

Issues.											Stock.				
Rate.	£	s.	d.	Date.	To.	Qty.	Rate.	£	s.	d.	Qty.	Rate.	£	s.	d.
											lbs.				
1/6		18	9	27/6/—	*PA 7A*	60′ 7½	1/6		11	3					
			9								44′ 5½	1/6		8	3

Receipts, Issues and Stock)

COST ANALYSIS

Order No.....*P. A.* 15....

Customer ..*Brown & Co*.....

Type... *D.C. 93, P.T. Motor*. .. .. Output.....12 *h.p.* .....

Volts... ..... 440..... R.P.M..... .... .. 500. ....

Extras ... ...*Baseplate and Bolts*.... . . ..

Ref.	Part.	No.	Material. W'ght.	@	£ s. d.	Labour. £ s. d.	Works Expense. £ s. d.	Works Cost. £ s. d.	Cost each. £ s. d.	
	CARCASE . .	1	5 – –	25/-	6 5 –			6 5 –		
	Bore and Turn					15 6	1 3 3	1 18 9		%
	Plane . .					3 2	4 9	7 11		150
	Drill and Tap					1 6	2 3	3 9		
					6 5 –	1 – 2	1 10 3	8 15 5		
	POLES —									
	(Stampings)	4	1 12	6d.	1 – –			1 – –		%
	Stamp out .					1 3	2 6	3 9		200
	Build . .					2 6	3 4	5 10		133⅓
	Fettle & Trim					2 –	2 8	4 8		
	Drill and Tap					1 6	2 3	3 9		
					1 – –	7 3	10 9	18 –		
	AUX. POLES									
	(Bar) . .	4	12		6			6		
	Saw . .					3	5	8		
	Turn . .					6	9	1 3		
	Drill and Tap					3	5	8		
	Mill . .					4	6	10		
					6	1 4	2 1	3 11		
	EYEBOLTS,									
	Screws, etc. .				3 6			3 6		
	PAINTING .					6 –	7 6	13 6		
					3 6	6 –	7 6	17 –		
	TOTAL COST .	£			7 9 –	1 14 9	2 10 7	11 14 4		
	BEARING END-SHIELDS—									
	Pulley End .		28	24/-	6 –			6 –		
	Bore and Turn					2 6	3 9	6 3		
	Drill and Tap					1 –	1 6	2 6		
					6 –	3 6	5 3	14 9		
	COM. END .		21	24/-	4 –			4 –		
	Bore and Turn					2 –	3 –	5 –	•	
	Drill and Tap									

DETAILED COSTING OF ELECTRIC MOTOR

COST DETAIL LEDGER

Pro. No.

JOB.....1,250 *K. V. A. Alternator.*

Brown.

P. A. 12.

Date.	Fo.	Purchases. General. £	s.	d.	Purchases. Inter Works.	Petty Cash, etc.	Stock Material £	s.	d.	Wages. £	s.	d.	Over-head. £	s.	d.	Total. £	s.	d.
19— *A.*																		
July 14		46	–	5			8	–	3	5	19	9	4	15	2	64	15	7
Aug.		62	11	3			25	13	7	4	12	6	4	19	9	101	17	1
Sept.		8	12	5			30	9	10	5	18	11	8	12	6	53	13	8
Oct.							174	2	7	51	6	9	64	7	6	289	16	10
Nov.			7	2			5	15	4	65	15	7	96	19	6	168	17	7
Dec.								18	2	13	19	–	18	7	4	33	4	6
																£712	5	3
19— *B*																		
Aug.		13	12	11			1	19	4		16	4		16	4	17	4	11
Sept.		3	9	5			2	12	9	1	19	7	2	19	4	11	1	1
Oct.			5	–			7	10	3	3	7	7	3	19	4	15	2	2
Nov.			3	8			3	14	–	13	9	7	16	12	–	33	19	3
Dec.			2	2			2	7	4	1	14	8	2	3	8	6	7	10
																£83	15	3
19— *C.*																		
Aug.			13	10			2	3	10		5	4		6	8	3	9	8
Sept.							9	10	7	2	1	8	2	15	11	14	8	2
Oct.								5	5	6	8	–	9	1	7	15	15	–
Nov.			18	2			13	11	–		16	8	1	2	3	16	8	1
Dec.			19	6				7	5	3	6	11	5	–	1	9	13	11
																£59	14	10

COST LEDGER—MONTHLY POSTINGS FROM ABSTRACTS

COST CONTROL

H.O. Order....*S.C.* × 56536/7168 *E.P.S.*..... Pro. No....*P. A.* 12....

Date....12*th June*, 19-- Date 13*th June*, 19--

Customer.....*Brown & Co*.....

Description of Order and Quantities. ..1-250 *K. V. A. Alternator*....

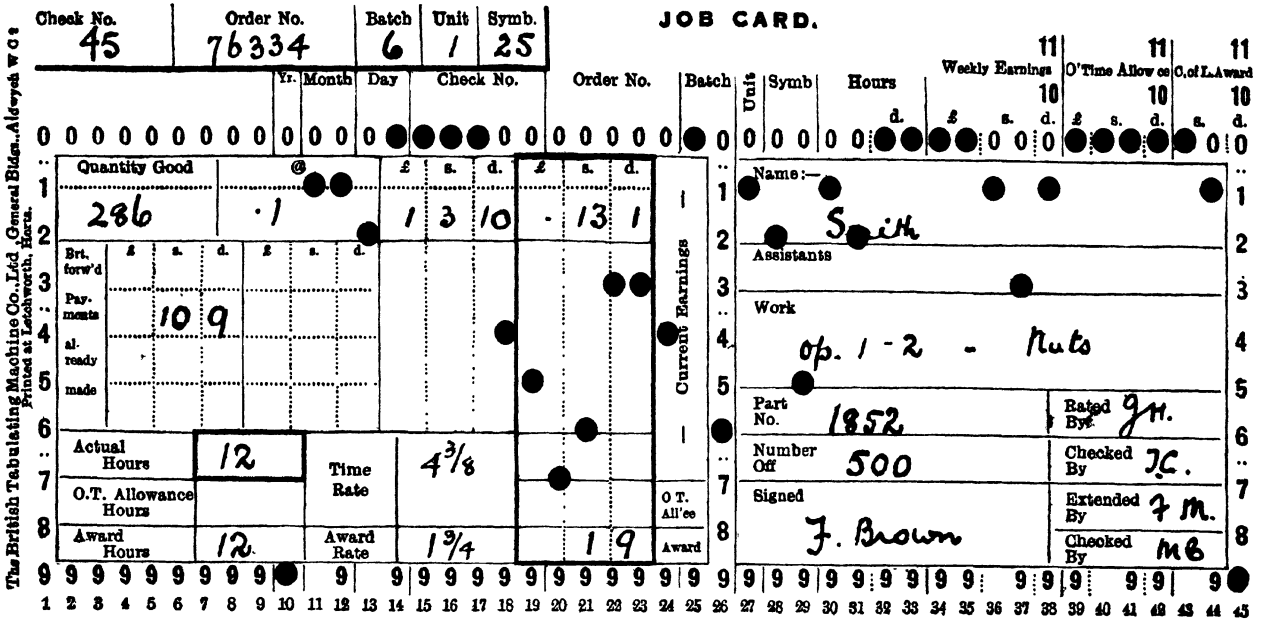
Date.	Estimate.	COST.																					
	Amount.	Purchases.			Petty Cash, etc.			Stock Materials.			Wages.			Overhead.			Development.					
19—																							
June 16												6	2		4	5							
July		46	–	5				8	–	3	20	19	7	17	7	–							
Aug.		82	3	5				34	16	10	9	13	11	9	11	6							
Sept.		12	1	10				43	11	11	10	–	2	14	7	9							
Oct.			5	–				189	9	6	65	14	8	83	7	10							
Nov.		12	4	3				29	16	2	97	1	5	138	16	11							
Dec.		40	17	2		14	7	6	10	2	35	5	9	39	–	3							
		193	12	1		14	7	312	4	10	239	1	8	302	15	8							

COST SUMMARY—MONTHLY POSTINGS FROM SUMMARY

LEDGER

Total.			Cost Detail Transfers.				CREDITS.									
			Sub	Heading.	Amount.			Date.	Description.	Fol.	W.C P.			Sale.		
			A	Alternator	712	5	3									
	10	7	B	Exciter	83	15	3									
92	7	3	C	Regulrs.	59	14	10									
136	5	8	D	Spare Arm	* 34	5	11									
80	1	8	E	Drawings	23	9	7									
338	17	0	F	Patterns	14	3	8									
277	18	9	G	Tools	14	19	4									
122	7	11	X	Testing	19	19	7									
1,048	8	10	Y	Packing	80	17	2									
			Z	Freight	4	18	3	Dec.	1/	121/						
					1,048	8	10		19	533	1,048	8	10	1,017	–	–

OF ABSTRACTS: DETAILS FROM COST LEDGER



HOLLERITH SYSTEM JOB CARD, SHOWING WRITTEN DETAILS AND CORRESPONDING PUNCHED RECORD

See page 192

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